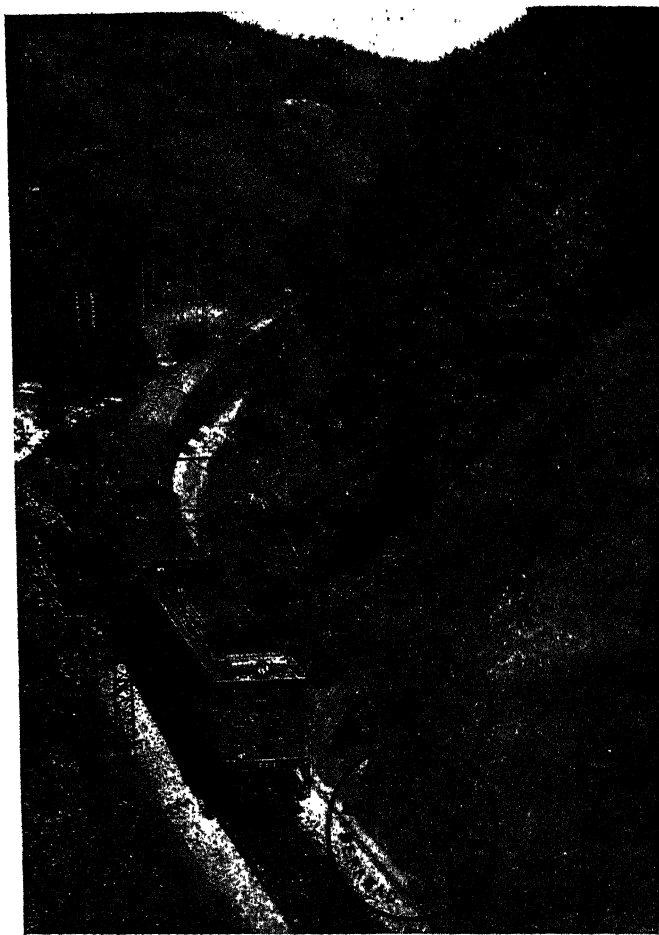


THE U.S.S.R.



THE SURAM PASS, GEORGIAN S.S.R.

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THE U.S.S.R.

A Geographical Survey

BY

JAMES S. GREGORY B.A. F.R.G.S.

FORMERLY GEOGRAPHY MASTER TRINITY COUNTY SCHOOL MIDDLESEX

AND

D. W. SHAVE M.Sc.

SENIOR GEOGRAPHY MASTER TRINITY COUNTY SCHOOL MIDDLESEX
LECTURER IN GEOGRAPHY METHOD WESTMINSTER TRAINING COLLEGE LONDON



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This world's no blot for us,
Nor blank; it means intensely, and means good:
To find its meaning is my meat and drink.

ROBERT BROWNING

Fra Lippo Lippi

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PREFACE

THIS book attempts to present the general reader with a survey of the Soviet Union in relation to its geographical background, and to give the student of geography some basic material for his studies.

Unfortunately, lack of information and the difficulty of consulting original works in the Russian language relating to the economics and geography of the Soviet Union, have resulted in ignorance which has precluded the serious geographical study of that country. Students and teachers alike have found the greatest difficulty in obtaining facts upon which to base their studies and their teaching. The purpose of this book is to present those facts, and to sketch the outline of the geography of the U.S.S.R. as it is to-day, attempting at the same time to indicate how the Russia of to-day has grown out of the old Russia before 1917.

Material has been gathered in the main from works published in the U.S.S.R. The authors wish to acknowledge their indebtedness to the Society for Cultural Relations with the U.S.S.R. for assistance in obtaining information. The society's library was particularly valuable in this respect. They also wish to thank Mrs L. V. Gregory for her assistance in translating, and Mrs Beatrice King, who kindly read the manuscript and made valuable critical suggestions.

The text was written by one of us (J. S. G.), in consultation with the other (D. W. S.), who wrote the chapter on climate and prepared the material for the maps and diagrams.

J. S. G.
D. W. S.

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INTRODUCTION

From great Moscow to the farthest border,
From our Arctic seas to Samarkand,
Everywhere man proudly walks as master
Of his own immeasurable Fatherland.

THIS refrain from a popular Russian song not only expresses the feeling of the Soviet people towards their country, but at the same time reflects the essence of the geography of the Soviet Union—unity in diversity, throughout a territory occupying one-sixth of the inhabited surface of the earth, and containing about 190 million people, who speak some 150 different languages. The Soviet Union is the second largest political unit in the world, exceeded in area only by the British Empire, which, however, unlike the U.S.S.R., does not consist of a single continuous territory. The area of the British Empire is 13 million square miles; that of the U.S.S.R. $8\frac{1}{2}$ million square miles.

The distance from Minsk to Vladivostock, a journey by railway of at least ten days, is more than 6000 miles. From Murmansk to the borders of Afghanistan, a seven-day train journey, the distance exceeds 4000 miles. Bears and wolves inhabit the Northern tundra and forest lands. In the far east, the Ussuri tiger roams. In the south, caravans of camels cross the deserts of Central Asia, while near the shores of the Black Sea citrus-fruit and tea-plantations flourish.

Out of these diverse natural conditions, a State has been created, a political, economic, and human unity, the strength of which has been demonstrated to the world since the invasion of Russia by the German Army. An examination of the geographical basis for this unity, and its growth, opens up a wide field of study which will amply reward the labours of the student, for not only has a nation emerged in this vast land, but within the last twenty-five years we have witnessed the unique spectacle of the correlation, adaptation, and use

of geographical factors in the large-scale planning of a country which is almost a continent.

The fundamental geographical factor is the immense Russian Plain, in which there are no real obstacles to movement, since the great mountain masses lie around the periphery. Across this plain flow mighty rivers, favouring transport and communications in a longitudinal direction, while their tributaries, and the low watersheds and portages between them, make latitudinal movement easy. It is the rivers which, as it were, bind the lands of the plain together.

Neither the forests of the North, nor the steppe and desert lands of the centre and South, possessed natural conditions suitable for the growth of strong settled communities in early times. Those states which grew up in the Caucasus, or in the oases on the borders of the deserts of Central Asia, were swept by the tides of the great civilizations which embraced them in order to secure their northern frontiers and maintain control of the trade routes between Europe and the East.

Only within the wedge of deciduous forest lands which protruded from Western Europe into the Russian Plain, between Leningrad, Moscow, and Kiev, was it possible for settled agricultural communities to develop and become strong, protected by forests and marshes from the attacks of the steppe nomads, and at the same time exceedingly well placed to control the waterways of European Russia. Having established their State, the Russians found no difficulty in moving out along the valleys across the plain to the highlands which surround it on the south and east.

But the political unity thus established did not in fact constitute an economic and human unity. Industry and agriculture, both in an appallingly backward condition until after 1917, were concentrated to a great extent in European Russia. The rest of the country remained as a series of remote and undeveloped colonial lands. It was only after 1917 that the planning of the entire country as a unit began—after the establishment of the new Union of Soviet Socialist Republics, each of which held, and still holds, a status equal to that of the others. In each part of the Union, mineral resources have

been exploited, industries established, and modern agricultural technique introduced. In addition to industrial and agricultural expansion in European Russia, huge new industrial and food bases have been built up in the Urals, Central Asia, Central Siberia, and the Far East. The Arctic Sea route has been opened and a vast system of inland waterways created. Electricity has been introduced to every corner of the land. From a human point of view, perhaps the most interesting feature is that every national group now plays its part in this work of reconstruction. The era of backward races has become a matter of interest only to historians. Thus, the lands of the Far North, the Far East, and the Asiatic deserts have come to life, and there is practically no corner of the U.S.S.R. which has not experienced in some form this great wave of constructional activity which has swept across the land in so short a period of time. There is almost no part of the Soviet Union which does not contribute in some measure to the economy and well-being of the whole.

The location of industries has been planned to ensure the maximum use of raw materials which lie close at hand. In agriculture, each area specializes in those crops for which it possesses the most favourable natural conditions. Hence we can observe a close correlation between geographical cause and effect. But Nature has not been left to take her own course. Man is guiding Nature, and already agriculture and industry have made considerable advances into the cold lands of the North and the deserts of Asia.

The development of vast new territories of the earth's surface is always a fascinating human drama. The opening up of the North American continent stirred the imagination of the peoples of the world for over a century. Within the last twenty-five years, however, we have witnessed the opening up of one of the last great territories of the Northern Hemisphere, but in an entirely new way.¹ The conflicting

¹ "Hope and energy once released, from the Pripet Marshes to Kamchakha, from Novaya Zemlya to the Oxus, there is a new world, a new North America, to be occupied and tamed."—SIR JOHN MAYNARD, *The Russian Peasant, and other Studies* (Gollancz).

endeavours of the millions of pioneers who swarmed across North America have been replaced by a gigantic system of planning, and in less than a quarter of a century a backward agricultural nation has emerged as one of the foremost industrial states of the modern world. The unity and stability of this state was put to the supreme test at the beginning of the present war.

When the industrial and agricultural centres of European Russia fell to the enemy the new industrial and food bases of the Urals, the Asiatic Republics, and the East were able to maintain the economic life of the country, and the Soviet Government is confident that in the event of an invasion of the Far East, the new food and industrial bases which have been established there could meet the needs of war as efficiently as they have met the needs of the growing civilian population in peace-time.

PART ONE

GENERAL SURVEY

CHAPTER I

Structure and Relief

AN understanding of the structure of the U.S.S.R. is fundamental to the understanding of its geographical and historical development.

The physical map of the Soviet Union (see Fig. 1) shows that the most outstanding feature of the country is the great Russian Plain, an extension eastward of the West European Plain, stretching as far east as the river Yenesei. Over this vast area only a few elevations rise to more than 1000 feet above sea-level, and, with the exception of the Urals, which divide the Plain into two parts, none of the elevations is mountainous in character. Although the Urals often rise to more than 3000 feet, the slopes are usually gentle, the surface of a plateau character, the passes low. Although they form a definite mountain range, they do not offer any great obstacle to movement from the East European section of the Plain to the West Siberian Lowland, its eastward extension.

The second striking physical feature of the Soviet Union is the presence of strong natural 'barrier frontiers' around the periphery of the Plain. To the south and east there are lofty mountains and plateaux. To the north there lies the Arctic Ocean, impenetrable until the opening of the Arctic sea-route a few years ago. Finally mention must be made of the rough, rocky land of Karelia, in the extreme north-west, along the Soviet-Finnish frontier, rising to more than 3000 feet above sea-level in the Khibin Mountains of the Kola Peninsula.

Thus essentially the U.S.S.R. consists of a vast plain, of generally rather low altitude, with mountains and highland

around its edges. This plain provided the land within which the first Russian State was born, and over which it grew and expanded. The lack of any pronounced physical features which might have separated one part from another, and so enabled another rival State-nucleus to develop,¹ also served to allow the expansion of the Russian State, without any natural obstacles, over very great areas, while the strong natural frontiers helped to shut off the Plain from the outside world during the period of that expansion.

Only on the west was there no strong natural frontier, and history records a continuous struggle throughout the centuries against neighbouring states in order to establish a permanent frontier where the East European Plain continues into Western Europe.

The great size of the Plain also made possible the development of large and long rivers. These were of the greatest importance to a country possessing such a vast land territory, and even to-day are valuable means of communication. Climatic factors have also been given an immense stage upon which to work, so that climatic regions are spread out on a grand scale across enormous areas. These in turn correspond closely to the major regions of national vegetation and to the major zones of soil, and since they extend from Arctic to sub-tropical latitudes, there are obvious and great possibilities for many diverse types of agricultural development. Near the junction of highland and plain there are important and varied mineral deposits.

It should now be clear that the Russian Plain is of more than mere academic significance.

THE RUSSIAN AND CENTRAL SIBERIAN PLATFORMS

The Russian Plain is divided by the Urals into the East European Plain and the West Siberian Lowland (see Fig. 2).

¹ Small rival Slav principalities, separated by relatively weak barriers (inter-moraine marshes), grew up in Central and North-west Russia, but the weaker were conquered and absorbed by the stronger, and hence did not continue to develop as independent states.

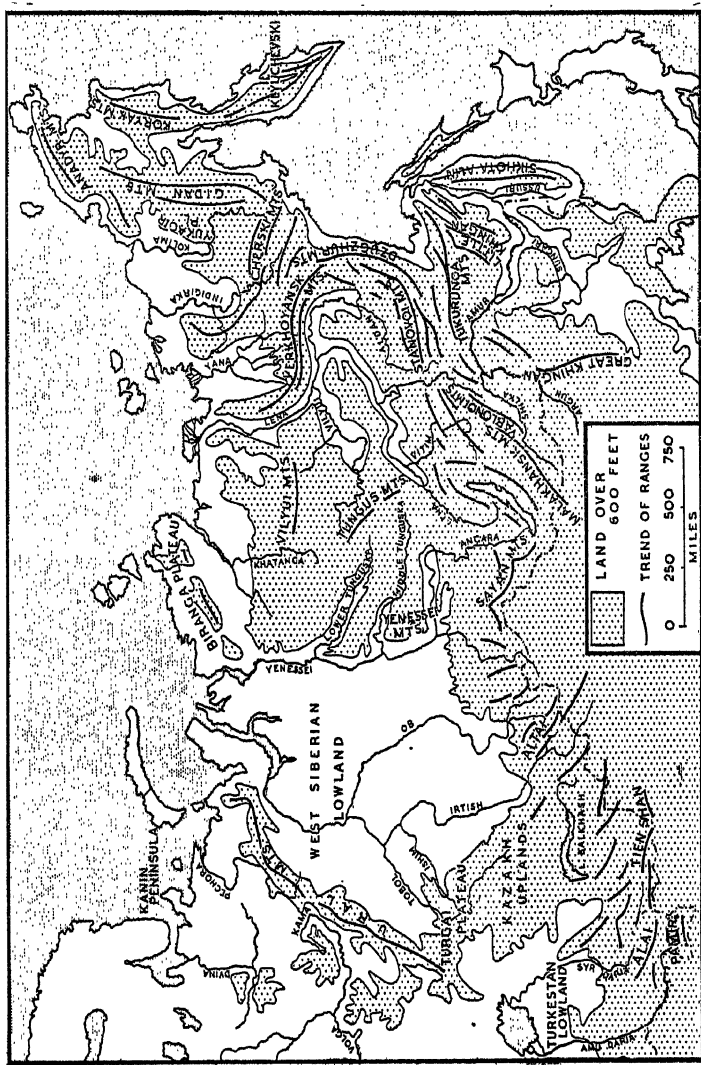


FIG. 1. THE U.S.S.R.: CHIEF RELIEF FEATURES

The latter extends from the Urals to the river Yenesei, while between this river and the river Lena lies the Central Siberian Plateau.

Underlying the sedimentary rocks of which the East European Plain and the Central Siberian Plateau are composed, and probably also deep beneath the West Siberian Lowland, there is a great thickness of ancient crystalline rocks, which form rigid blocks of the earth's crust. They are composed of rocks belonging to the Archæan period, denuded and metamorphosed in ancient times. Since Archæan times these blocks have remained resistant to the processes of folding and mountain-building, which have caused only slight bending and cracking, faulting, and vertical movements, so that in general the sedimentary rocks deposited upon them have remained more or less undisturbed and almost horizontal.

These ancient rigid regions of the earth's crust have been named 'continental platforms.' The platform upon which rests the Central Siberian Plateau was covered with marine sedimentary deposits during the Palæozoic period. Then the land was raised up *en masse*, and subsequently faulted and dislocated, eroded and dissected, by weathering and river action, so that to-day it has a mountainous surface. The platform underlying the East European Plain, however, was covered entirely or in part by the sea many times, while during the periods between the transgressions it was raised up and became dry land, or was covered with areas of shallow water. Thus we can find to-day sedimentary deposits ranging from the Silurian to the Tertiary periods. When it was finally raised above the level of the sea and assumed its present continental form at the beginning of the Quaternary period it was not elevated to a great height, and this fact, together with the relatively recent elevation, accounts for the small amount of dissection and erosion which has taken place, as compared with the Central Siberian Plateau.

Between the two platforms was a geosyncline, in which sedimentary deposits were laid down from very early times until after the Tertiary period. Even after the Quaternary Glaciation marine deposits were formed in the northern part.

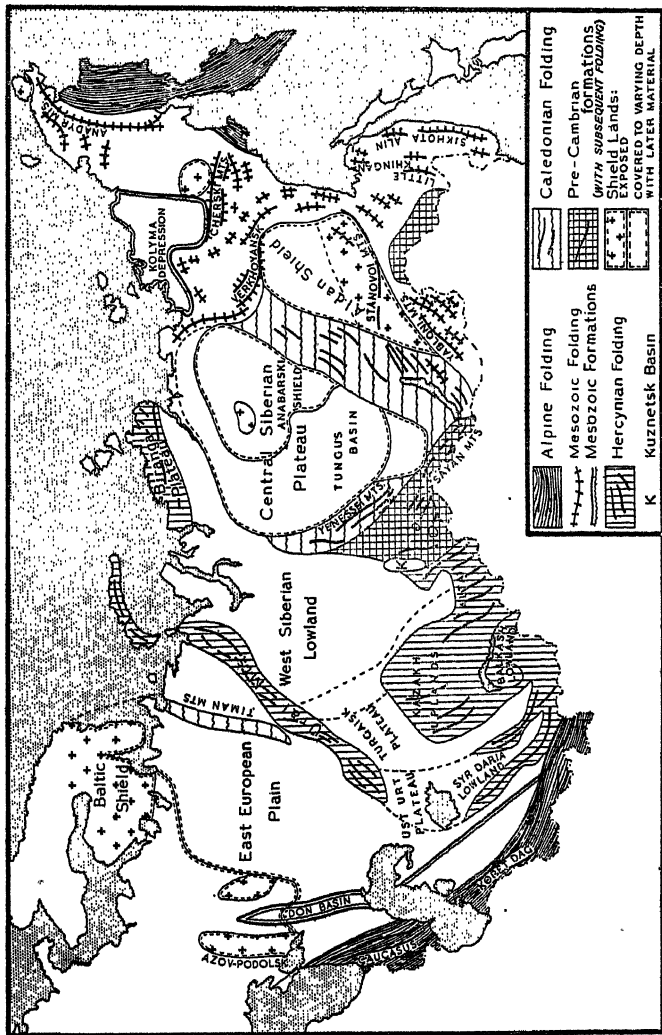


FIG. 2. STRUCTURE OF THE U.S.S.R.

When eventually the land was raised above sea-level its elevation was relatively slight, so that to-day the West Siberian Lowland remains as the lowest section of the Russian Plain, with the exception of the depression around the shores of the Caspian Sea. Its low level has prevented the occurrence of any considerable amount of dissection due to river-action or weathering, and it is one of the most extensive level areas of the earth's surface. Towards the south-east it is continued in the Turan Lowland, around the Aral Sea. This area was part of the bed of the sea which extended westward and embraced both the Black Sea and the Caspian Sea until the end of the Tertiary period.

THE ANCIENT CRYSTALLINE SHIELDS AND ELEVATIONS IN THE ANCIENT PLATFORMS

It has been established that the thickness of sedimentary deposits laid down upon the ancient platforms reaches several thousand feet, and it is clear that marine deposits of such a thickness could only accumulate, without filling the sea basin, if there was a simultaneous downfolding of the sea floor.

A cross-section of the East European Plain (see Fig. 3) shows that there is in fact an extensive downfolding of the platform, and where the outer rim of the geosyncline reaches the surface the outcrops of ancient crystalline rocks, exposed or thinly covered by sedimentary deposits, are called 'shields.' They are often considerably faulted and dislocated.

In the East European Plain two such formations are found:

- (1) A portion of the Baltic Shield, in Karelia.
- (2) The Podolsk-Azov Shield (see Fig. 4).

Similar outcrops occur along the southern edge of the Central Siberian Plateau (see Fig. 2). They form mountainous country extending to the north-east from Lake Baikal towards the Okhotsk Sea.

Faulting in the Karelian Shield has had a considerable effect upon the relief. The Gulf of Finland, the strait between

the Barents Sea and the White Sea, as well as Lakes Onega and Ladoga, are all bounded by major lines of faulting.

The ancient crystalline rocks are fully exposed in Karelia, forming a smooth, low massif, composed mainly of rocks such as granite and gneiss, and almost devoid of soil cover in many

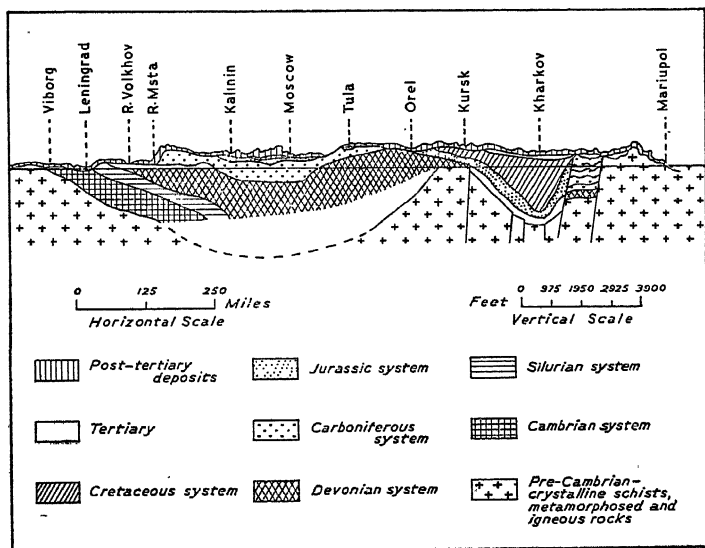


FIG. 3. GEOLOGICAL SECTION FROM NORTH TO SOUTH ACROSS EUROPEAN RUSSIA
(after Potemkin and Malenka)

areas. The average height is from 300 to 1300 feet. In the north high altitudes are reached in the Khibin Mountains and the Lovozerski Massif, which rise to over 4000 feet. The landscape in the Kola Peninsula is one of smooth, rounded elevations, while farther south the ancient rocks form a low plateau, covered with later glacial deposits.

The ancient crystalline rocks, devoid of soil, together with the boulders and other glacial deposits which cover so much of Central and Southern Karelia (see p. 30) make agriculture

extremely difficult. Thus, until recently, fishing, lumbering, and hunting were the main human occupations.

The discovery of minerals in the Khibin Mountains, however, has led to the establishment of industry in these northern latitudes, and the development of specialized forms of agriculture to supply the industrial workers with food (see p. 274).

The Podolsk-Azov Shield (see Fig. 4) is also composed of granite, gneiss, and schists, usually covered with Tertiary deposits and loess. Only a portion is exposed, mainly west of the river Dnieper, where the Podolsk Plateau has an elevation of from 600 feet to a little more than 1000 feet above sea-level. It slopes gently towards the south-east. The central and eastern parts of the plateau are dissected by numerous valleys, with steep sides, and where the Dnieper crosses the hard rocks of the shield rapids occur.

Apart from these outcrops, the rocks of the platform come near to the surface in other parts of the East European Plain, owing to faulting and fracturing. The rocks have been raised up to form horsts or have subsided and form graben. In some cases the dislocation took place in pre-Cambrian times, in others it occurred in geological periods varying from the Palæozoic to the Tertiary and Quaternary periods. In the following cases they exert some influence upon the contemporary relief: the Kursk-Voronezh Horst, running in a direction from north-west to south-east, across the Central Russian Upland; the Ufa Plateau, on the western flanks of the Central Urals; the Stavropol Plateau, on the northern edge of the pre-Caucasian region; the Ust-Urt Plateau, between the Caspian Sea and the Sea of Aral, and the Pwitkova Hills, to the south of Pechora Bay (between the mouth of the Pechora and the Urals).

The downfold of the ancient platform is responsible for the formation of the Moscow basin. Reference to Fig. 3 will show that this geosyncline is limited by the Kursk-Voronezh Horst, while the latter forms the northern edge of a region of faulting in the ancient rocks, which has let down the overlying strata to form the Donetsk basin. This was a gulf of

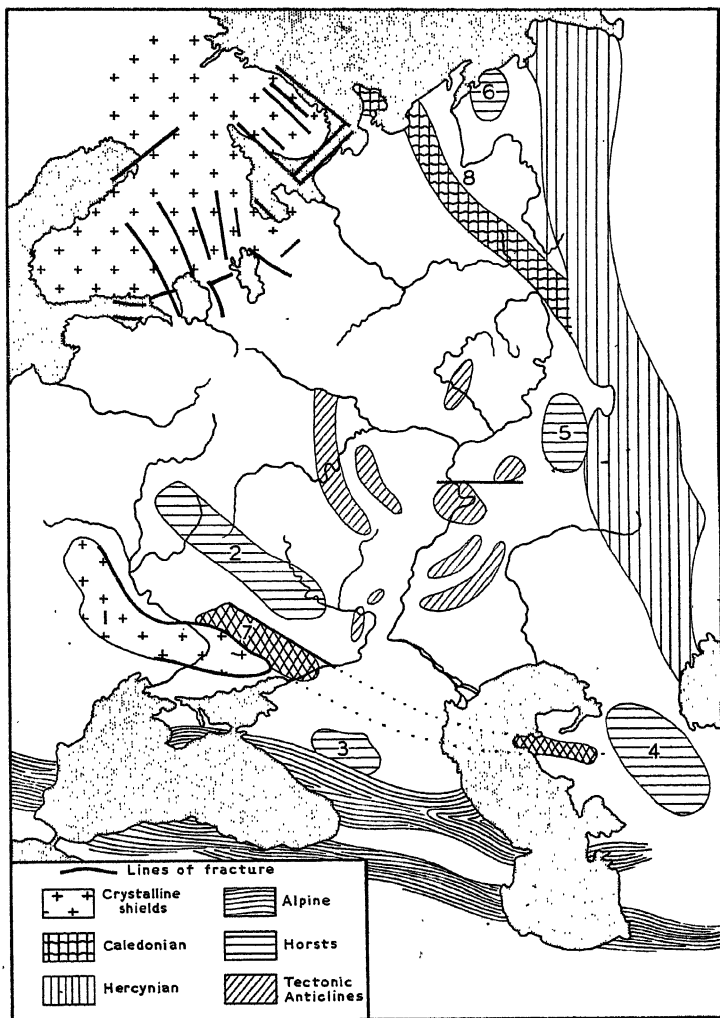


FIG. 4. STRUCTURE OF THE EAST EUROPEAN PLAIN

- 1, Podolsk-Azov Shield; 2, Kursk-Voronezh Horst; 3, Stavropol Plateau;
4, Ust-Urt Plateau; 5, Ufa Plateau; 6, Pwtkova Hills; 7, Donetsk Basin;
8, Tianshan Mountains

the great Carboniferous sea which extended from the Arctic to the Caspian Sea. The Carboniferous strata include the Donetsk coal-measures and the brown coal of the Moscow basin. The southern edge has been uplifted, and folding and dislocation in the Hercynian period of mountain-building produced the Donetsk Heights, continued south-eastward, and revealed again in the heights of Mangyshlack, on the eastern side of the Caspian Sea.

The Donetsk Heights rise to over 1000 feet, and are composed of faulted and folded rocks of the Carboniferous period, with some schists and rocks of the Permian and Mesozoic periods in the north-west. Beneath these formations lie ancient rocks which form an extension of the eastern part of the Podolsk-Azov Shield. The erosive action of streams has dissected the land to a great extent, providing a very varied landscape of river valleys and undulating relief.

Tectonic movements were also responsible for the formation of the Central Russian Upland, a plateau sloping gently upward from the Dnieper lowland and ending with a steep escarpment overlooking the Don lowland. Owing to its gentle slope it does not break the continuity of the Plain, although it rises to a height of 900 feet and more. Broad, mature valleys vary the monotony, and this accounts for the common description of the East European Plain: that it appears monotonous or undulating from the higher parts, but hilly from the valleys.

In addition to the Podolsk Plateau and the Central Russian Upland, there is another elevation of tectonic origin: the pre-Volga Heights, a plateau sloping gently from the Don valley and falling steeply to the valley of the Volga.

Deep borings have revealed other variations in the surface of the platform, which have a limited effect upon the relief. The anticlinal upswellings are shown in Fig. 4.

Finally, tectonic dislocation which occurred during the periods of mountain-building brought ancient rocks up to or near the surface in the Urals, the Caucasus, and in the mountains of Siberia and Central Asia.

Just as the exposure of ancient rocks described above occurs

mainly around the edges of the Russian Plain, the mountains also were formed on its periphery.

THE FORMATION OF THE RUSSIAN PLAIN

The East European Section

We have already described how the whole of the Russian Plain, based on rigid crystalline rocks, was not affected to any great or appreciable extent by folding. Thus the epeirogenic movements which lifted the land vertically, or depressed it, merely allowed marine transgressions to cover the old rocks with sedimentary deposits which have remained practically horizontal and so have brought about the creation of the Plain.

The Central Siberian Plateau became dry land in very early times, while the East European Plain was finally raised up only in Quaternary times. The Black Sea-Caspian Sea depression was for a very long period part of a great Southern Ocean which included the present Mediterranean Sea, from which the Black and Caspian Seas, at first a single sea, were separated in the Tertiary period. The final separation of the two latter seas took place towards the end of the Tertiary period, when the land surface of the U.S.S.R. began to assume a shape substantially similar to that which it has to-day.

During the Quaternary period the surface of the East European Plain was subjected to a whole range of geological processes which determined many of the present details of relief, and the river net as we know it to-day was created. The most important event, and one which has profoundly influenced the geography of the Soviet Union, probably more than any other geological phenomenon, was the Quaternary Glaciation.

Glaciation also occurred in the Siberian section of the Plain, but owing to its special and peculiar features, that will be dealt with separately.

During the Great Ice Age there were at least three glacial periods during which the ice-sheets advanced. In the inter-

glacial periods the ice receded, leaving the land-surface free. (See Fig. 6.)

On this basis, therefore, the Russian geologist Yakovlev divides the East European Plain as follows:

(a) Those areas which were covered by the ice-sheets.

(1) Regions where the effects of 'Ice-ploughing' were predominant.

(2) Regions where the effect of the ice was chiefly the deposition of sedimentary materials.

(b) Those areas which were not covered by the ice, but were affected by fluvio-glacial and other deposits of glacial origin.

(a) AREAS WHICH WERE COVERED BY THE ICE-SHEETS

(1) *Regions where the Effects of 'Ice-ploughing' were Predominant.* These regions lie on or close to the centres from which the Quaternary ice-sheets moved out. These centres were Scandinavia, Northern Karelia, Novaya Zemlya, and the Northern Urals.

From Scandinavia the ice moved outward in a south-easterly direction, and from the Kola Peninsula in a north-easterly direction. The greatest effect of ice-ploughing is to be seen, therefore, in Finno-Karelia. Here the old rocks of the shield have been rounded, smoothed, scratched, and polished, in a direction corresponding to the movement of the ice, leaving a landscape of gentle, smooth, rounded upswellings, with hundreds of lakes occupying hollows scooped out by the ice.

Along the coast the ice gouged out deep valleys which later formed fiords. Since the coast was raised slightly after the Glacial period, many of these are preserved to-day as typical glacial valleys.

Near the centre of origin of the ice-sheets the scouring effect of the ice was so great that throughout Karelia large areas of the country have been left as regions of barren rock without any cover, even of morainic clays. In some areas rubble and boulders are scattered about haphazardly.

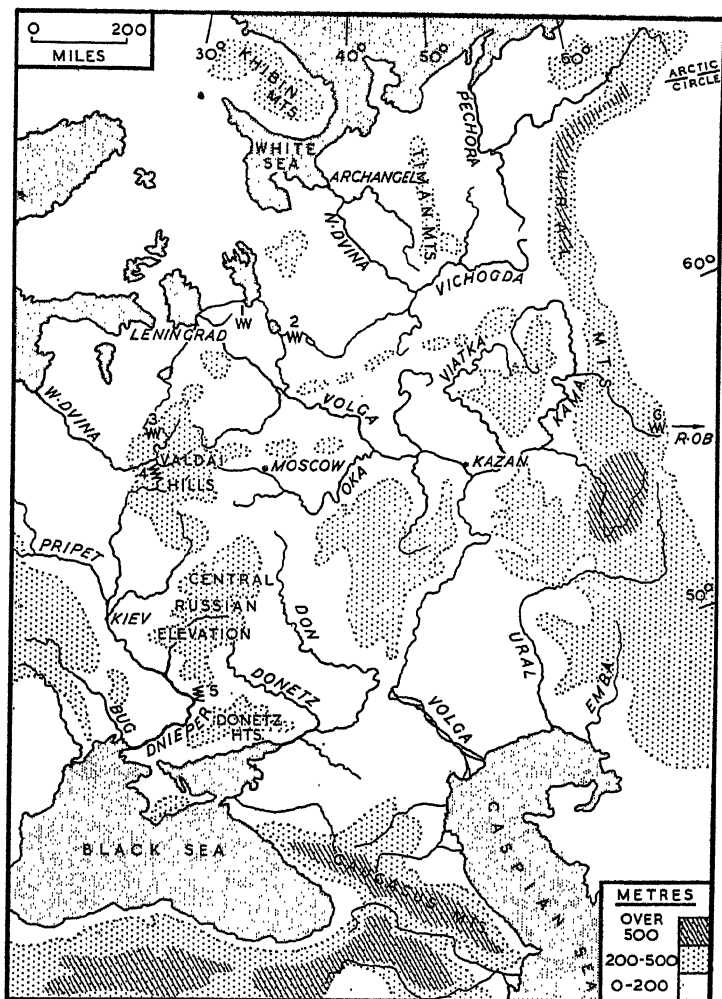


FIG. 5. THE CHIEF RELIEF FEATURES OF THE U.S.S.R. IN EUROPE

CHIEF PORTAGES: WV 1, Volga-Lake Ladoga; 2, Volga-North Dvina;
3, Lovat-West Dvina; 4, West Dvina-Dnieper; 5, Dnieper rapids;
6, Kama-Ob.

At the end of each glacial advance, when the ice began to melt and recede, huge accumulations of boulders and clay were left behind, forming terminal moraines along the edge of the ice-sheet.

In Karelia we find the continuation of one of the best-defined terminal moraines in the world—the Finnish Salpausselkä, a double wall of hills, the outer chain of which stretches from the Soviet-Finnish frontier, north of Lake Ladoga, continuing between that lake and Lake Onega in a north-easterly direction towards the White Sea. The inner wall extends in a northerly direction through the centre of Karelia, to the Kola Peninsula. Around the coast of the Peninsula itself there are further morainic hills.

In North Karelia there are also extensive areas of bare, monotonous rocky country without moraines or fluvio-glacial deposits. In the centre and south the many boulders strewn over the surface, together with *roches moutonnées*, and the sandy-clay nature of fluvio-glacial deposits, make the country equally difficult for agriculture.

Near the shores of the White Sea the relief of the land was levelled out by the abrasive action and the deposition of sediments caused by the marine transgression which took place at the end of the Glacial period and afterwards. This transgression formed a strait joining the White Sea to the Baltic across the Lakes Onega and Ladoga. The basins of these lakes were formed tectonically, but they represent also the remnants of this marine transgression.

The sea also invaded the shores of the Kola Peninsula, changing the glacial valleys into fiords. When finally these areas occupied by the sea were uplifted the level surface and the bad drainage—especially in those parts which were only slightly raised—contributed to the formation of extensive marshes and peat bogs, developed to the greatest extent around the southern and western shores of the White Sea.

The young and immature river net has not worn out deep valleys, and the youth of the drainage system is further reflected in the presence of numerous rapids.

(2) *Regions where the Effect of the Ice was chiefly the Deposition*

of Alluvial and Sedimentary Matter. As the ice moved towards the south and south-east it met an obstacle—the Central Russian Upland. It was not able to proceed over this any farther than Bryansk. It was then forced to divide into two tongues, one moving down the Dnieper valley and the other along the Don valley.

At the same time another extension of the ice moved eastward from Scandinavia, and joined the ice moving south from Novaya Zemlya to the South Urals. The combined ice-sheet then moved eastward towards Perm.

The North-central Section of the East European Plain

Everywhere the ice was moving over relatively soft rocks, with a level surface, offering little resistance to its passage, so that no great hollows were gouged out. Hence the main action of the ice was confined to creating moraines and laying down fluvio-glacial deposits. During the inter-glacial periods the waters from the thawing ice tended to destroy the moraines and bury them under alluvial material which was washed out by the glacial streams.

Hence east of a line running from Smolensk to Vologda, the landscape consists of large plains, formed from fluvio-glacial deposits, together with the remnants of morainic chains.

The most important of the moraines run in two lines across the north centre of the Plain, one extending from the Valdai Hills (from 900 to 1000 feet high) towards the north-east and south-west. This is a very important water-divide from which flow the great rivers to the north, north-west, south, and south-east. The low watersheds separating the upper courses of the rivers made this region ideal for the establishment of portages, and in the early history of Russia the small Moscow State, situated at a point from which these portages could be controlled, was able to control the entire transport system of the East European Plain. The second chain of morainic hills, running from Smolensk to Moscow and thence in a north-easterly direction towards the Urals, is not so well preserved.

But these moraines are relatively minor features in comparison with those farther to the north-west, described below.

The Great Baltic Terminal Moraine Zone

This stretches along the western side of a line commencing in Northern Poland and proceeding through Smolensk, Vologda, and farther, north-eastward towards the Timan Mountains.

There are three main lines of low hills in this zone running more or less parallel to each other and corresponding to the three glacial advances. The total width varies from 60 to 180 miles, and in the lowlands between the moraines are shallow lakes, the result of the poorly developed river net and the level surface.

These ridges are of the greatest importance. Raised above the low marshy country which separates them, the clay soil is richer and warmer and more suitable for agriculture than on the lowlands. Villages and hamlets tend to be concentrated along the ridges, while a number of towns occupy strategic positions upon them. Even the modern road and railway net is strongly influenced by these hills, as can be seen from the prevailing direction of lines of communication—from south-west to north-east. The Great Terminal Moraine zone also forms the watershed between the rivers flowing to the north and north-west on the one hand, and to the south and south-east on the other.

Lake Deposits of the North-western and Northern Parts of the East European Plain

As the melting ice receded its edge fell back to the west of the watershed mentioned above, compelling the waters from the rivers and from the melting ice-sheet to concentrate in vast lakes which eventually found outlets in the Baltic and White Seas, leaving only remnants of the lakes visible to-day, but also leaving great areas of old lake-beds—level plains, covered with lake deposits.

These plains are found in a wide zone extending from the

White Sea to the Baltic, through the Baltic republics of Estonia, Latvia, and Lithuania. Moraines, boulders, drumlins, etc., bring a little variety to the landscape; but these features are definitely subordinate to the plains. The flat surface and the immature drainage system have combined to produce many peat-bogs and marshes, especially in the North Dvina and Pechora basins, and near Leningrad and the southern shores of Lake Ladoga.

The ice-sheet centred on the North Urals, which also left behind a number of morainic hills and ridges during its retreat, combined with the Scandinavian ice to form one great sheet. This held up the waters of the Dvina and Pechora basins, and at one period the North Dvina drained into the Volga system to the south. The waters of these two rivers formed large lakes, divided into basins by the Timan Range.

The east-west direction of some parts of the courses of the rivers is due to the fact that they were compelled to run along the edge of the retreating ice. When eventually the Scandinavian and Urals ice-sheets, during the course of their retreat, split apart, the Pechora river was able to find a way out towards the north. Later the North Dvina made its way along the edges of the Scandinavian ice, through the lower Pinega valley, and then northward into the sea along the Kuloi valley. It established its present river-mouth at a later stage.

Many peculiarities of the river net in the north of the Plain can be traced back to the end of the Great Ice Age. For example, extensive terrace formations and alluvial deposits mark the course of former river-beds.

The lake deposits have formed vast level plains between the upper courses of the rivers, of great value in the establishment of portages between the streams. Moraines are not strongly developed on these plains.

Southern and Central Plains of Fluvio-glacial Sands and Clay Deposits

In Western Europe, during the Great Ice Age, the rivers which flowed northward from the Alps and the Carpathians

were compelled, when they met the edge of the ice-sheet, to turn to the west and flow into the North Sea. These rivers received a great many tributaries from the edge of the melting ice, and carried so much water that they were able to create very large valleys. Farther east, for the same reason, the Dnieper, Don, and Volga also created wide valleys in their course towards the Black Sea-Caspian Sea depression.

The great weight of the ice which penetrated to the south in two great tongues along the Don and Dnieper valleys caused a caving in of the surface, and formed large depressions into which the surface waters flowed. As the ice melted and retreated these depressions received great quantities of water, and finally they were left as extensive lowlands, plains covered with great thicknesses of alluvial sands or clays, with a poorly developed river net, and containing large areas of marsh. The Pripet Marshes form the most outstanding example. They are connected to another lowland, representing a dried-out marsh, stretching for more than a hundred miles to the east of the Dnieper, above the rapids at Dnepropetrovsk.

The moraines in these plains have been partly washed out by running water, and partly covered over by alluvial deposition, so that only scraps remain, broken, low hills, running from south-west to north-east.

There is an interrupted zone of these sandy and alluvial plains all along the edge of the retreating ice (named "Pol-yessie" in the valleys of the Desna and other tributaries of the Dnieper in the Northern Ukraine), on one side of the Central Russian Upland. On the other side is the Oka-Klyazma region, stretching eastward from Moscow, while to the south there is a similar lowland in the Don valley. Two others lie to the north-west and south-east of the Oka-Klyazma region respectively, the former north of Rybinsk and the latter to the east of the Vetluga river. All of them are similar in formation, but were formed at different periods of ice-regression. For this reason the older plains are dried out, and have developed well-defined river systems, while the younger ones are badly drained, and during the spring floods are inundated, forming immense lakes, very similar in appear-

ance to their condition during the later stages of the glacial period.

Between these lowlands, lying parallel to and south of the Great Terminal Moraine zone, there are large areas covered with clays, probably deposited by waters from the melting ice which were compelled to spread out owing to difficulty in finding an outlet. The clay surface is slightly undulating, and much subjected to the effects of gully formation. In many districts the clays have been washed out by the water, and reformed as diluvial deposits, rich in mineral substances and salts favourable to plant growth, making good soil and so forming areas particularly suitable for agriculture.

Generally speaking, the effect of the practically horizontal nature of the underlying rocks in the northern and central portion of the East European Plain, combined with the widespread deposits of glacial material, has been to produce a remarkable uniformity of surface soils over vast areas, particularly suitable for large-scale farming. On the other hand, the cold, damp, poorly drained glacial soils have combined with climatic factors to limit the variety of crops. Rye and flax were for long the main cultivated crops.

(b) REGIONS NOT COVERED BY THE ICE-SHEETS

The Loess Plains and Plateaux of South Russia

These are regions which lay outside the area of glacial cover, but which have had their surfaces covered by loess deposits of glacial origin. They occupy the broad valleys of the south-flowing rivers and the elevations between them.

It is evident that the loess was formed at the same time as the moraines, since humus layers found in the loess indicate that soil-forming processes were at work during the interglacial periods, and that there were two or three such periods.

Towards the north the loess becomes closely connected with the clays and fluvio-glacial deposits described above. East of a line joining the 'elbow' of the river Don with the watershed between the upper Don and the upper Dnieper, the loess gives way to loessic clays.

Generally speaking, the loess simply cloaks the underlying relief, following its contours fairly closely. On the higher ground, however, as in the case of the Donetz Heights and the Azov-Podolsk Shield, the cover becomes thin or is entirely absent. The loess has produced some levelling, however, and there are vast expanses of gently undulating land, where the main features of relief are steep-sided gullies and ravines, worn out by the action of rains and snows. The porous structure of the loess does not permit the accumulation of water on or near the surface. Hence marshes and bogs are never found, and since the rivers are of ancient origin they form a well-defined system, possessing broad valleys, and extensive catchment areas. The left banks of the southward flowing streams have gentle slopes, while the land falls abruptly down to the rivers on the right banks. According to one current theory, this is due to river erosion, caused by the direction of the earth's rotation.

Both the physical properties of the loess—friability, porosity, permeability, absorption, and easy aeration—and the rich mineral content make it an ideal basis for the formation of soil. Hence these areas possess the rich chernozem black soils—soils which have been cultivated for centuries and still yield rich harvests, showing little evidence of exhaustion.

The origin of loess is not completely understood. In the Soviet Union, where extensive study has been made of it, there are still a number of conflicting theories. The most acceptable theory is that it is a wind-borne, or æolian, deposit carried from the glacial clays left behind at the edge of the retreating ice and dried out into dust under conditions of desert climate.

The Lands along the Volga

The Middle Volga. This region includes the land on either side of the river Volga, between Kazan and Saratov.

Along the entire course of the middle Volga the most outstanding feature of relief is formed by the pre-Volga Heights, stretching meridionally along the right bank, and representing a strongly dissected and gullied plateau, formed

by tectonic dislocation and constructed chiefly of Permian, Jurassic, Cretaceous, and Tertiary strata. The surface became dry land and was reduced to a peneplain in Tertiary times. It was then uplifted so that a new stage of erosion commenced, and the present system of valleys was produced.

On the west the land slopes gently down towards the Don. But overlooking the Volga, the edge of the plateau is steep, often cliff-like in appearance.

The northern and lowest part, ranging in height from 490 to 520 feet, is cut up by valleys formed by glacial streams, originally flowing to a great lake depression above Kazan. These valleys are filled with sandy deposits. The Volga valley above Kazan, with its high and rather steep sides, seems to be of very recent origin. In glacial times there must have been a barrier stopping the outflow of water from the great lake depression formed along the edge of the ice-sheet. The ridge of the Dzhiguli Heights, hills composed of Carboniferous and Permian strata, presented the obstacle. To-day the Volga flows for some distance along the edge of the ridge, at its foot, in a west to east direction, and finally breaks through at the "Samara Gates" (at Kuibishev). West of the Gates, however, there are traces of an older pre-glacial valley, between Ulyanovsk and Syzran, along which the Volga flowed until, probably, the last inter-glacial period.

South of Kazan the pre-Volga Heights rise to 800 feet in the latitude of Ulyanovsk, and to about 1700 feet between Syzran and Saratov.

On the opposite bank there is a large expanse of plain, covered by a thick sheet of clay, strongly dissected and gullied, and stretching eastward to the Obshchy Syrt Hills, a continuation of the Urals. The clays are yellow-grey in colour, compact and unstratified, containing a high percentage of lime. They often resemble loess in appearance, especially on the steep sides of gullies or ravines. They are thought to be the diluvial products of the weathering of chalk or limestone over a very long period.

Towards the north of this plain another physical region commences—the northern trans-Volga region.

This area, including the Tartar Republic, the Bashkir Republic, and part of the Urals region, was dry land from Tertiary times, subject to the action of weathering and river-erosion. Consequently there is a well-developed river system, with wide valleys, such as those of the Kama, Belaya, and Ufa rivers. A mantle of thick clays, similar to loess in appearance, but not porous, often cut by gullies and ravines, covers over and levels out the unevenness of the older relief to a great extent, although underlying rocks are exposed in some places.

These clays are the product of the weathering of the sedimentary rocks which lie underneath them. Tiny particles of such weathered rock were gradually transferred down the slopes of the older relief, gradually filling in the depressions, and thus creating the contemporary plain. These diluvial clays, in common with loess, form the basis of fertile soils—not quite so fertile as loess, however.

The Lower Volga. On the right bank of the Lower Volga the pre-Volga Heights are continued towards the south in the Ergeni Heights, which finally slope down to the pre-Caspian Lowland, much of which is below sea-level.

Near Saratov the pre-Volga Heights reach an altitude of more than 800 feet above sea-level. But a depression occurs at the point where the Don and the Volga come close together, and here the height falls to 325 feet, again rising, south of Stalingrad, to from 490 to 620 feet, and maintaining this elevation in the Ergeni Hills as far as the Manych depression. On the southern side of this depression, there is the Stavropol plateau, a horst formation of the pre-Caucasus.

East of the Volga, the vast, level pre-Caspian Lowland extends to the Obshchy Syrt, Mugodzhar, and Guberlinski Hills. In the south, approaching the Caspian Sea, the lowest parts reach almost 85 feet below sea-level. In the south-east the land rises above sea-level in the Ust-Urt Plateau.

This great low plain, the pre-Caspian Lowland, was for a considerable period, at the end of the Tertiary and during Quaternary times, the floor of a large sea, upon which a great accumulation of marine sediments occurred—thick

horizontal layers of clays and sands, which have been responsible for the exceedingly level surface that we see to-day.

The soils are saline, and therefore can support very little plant life, so that there is an absence of humus or plant cover to protect the surface. Hence the wind is able to break it up, carrying it away in the form of tiny sandy particles, which form moving and stationary dunes, such as are to be observed covering a great area of the coastal regions bordering upon the Caspian Sea.

CONCLUSION

Major Relief Regions of the East European Plain

It will be gathered from the preceding description that the East European Plain is not of a completely monotonous character. The variations in relief may be summarized as follows (see Fig. 6):

(i) *The Glacial Lowland and Moraines of Karelia.* In the extreme north-west of the U.S.S.R. Karelia forms an area of low elevation, comprising a part of the Baltic shield. The ancient rocks have been laid bare, and often gouged into hollows, occupied by lakes, by the ploughing action of the ice. There are also two important lines of terminal moraines. Marine deposits have created large areas of level country, in which extensive peat-bogs and marshes have developed. The Khibin Mountains form the most outstanding heights.

(ii) *The Morainic, Fluvio-glacial, and Lake-bed Plains.* South and east of Karelia stretches the Great Baltic Terminal Moraine Zone, with extensive plains (the beds of old lakes), lying to the west of the long lines of morainic hills, and tracts of flat marshy country lying between them.

To the south there are great plains of fluvio-glacial and lake deposits, comprising a great deal of sand.

(iii) *The Depressions of the Upper Don and Dnieper, and Volga.* These are low-lying plains covered with much alluvial material and having wide areas of marsh. Low, broken remnants of moraines are visible in places.

(iv) *The Southern Plains, with River Valley and Gully Variation.* Outside the limit of Quaternary glaciation fluvio-glacial

and loess formations, together with deposits caused by the weathering and erosion of the sedimentary rocks, have masked the older relief forms to some extent and accentuated the plain relief of the country.

There are gentle upswellings of the surface between the main rivers, rising gradually to plateaux varying from 600 to 1000 feet in height. But they do not break the plain, and have steep slopes only where they overlook the western banks of the rivers. These elevations are the Podolsk Plateau, the Central Russian Upland, and the pre-Volga Heights. The mature river system has worn broad, deep, gently sloping valleys into these elevations. On the other hand, the loess and clay cover, especially on the plateau surface, is often broken by gullies and ravine-like formations. In the south the Donetz Heights rise to a height of 1000 feet. The higher parts present a plateau surface, gently undulating, while the numerous valleys create a varied landscape.

(v) *The Caspian-Kuban Depression.* This lowland, a monotonous and level plain, lies on the ancient bed of the Caspian Sea and is connected with the shores of the Black Sea by the Manych depression, itself an old gulf which formerly connected the two seas. The level plains are covered with great depths of alluvial material and some loess.

The Siberian and Central Asiatic Lowlands¹

The Siberian and Central Asiatic Lowlands may be divided as follows:

(a) The West Asiatic Lowland:

- (1) The West Siberian Lowland.
- (2) The Turgai Plateau.
- (3) The Turkestan or Turansk Lowland.
- (4) The Ust-Urt Plateau.

(b) The North Siberian Lowland and the Kolyma depression.

¹ Based on the Geomorphological Regions of L. S. Berg. (See Figs. 1 and 2.)

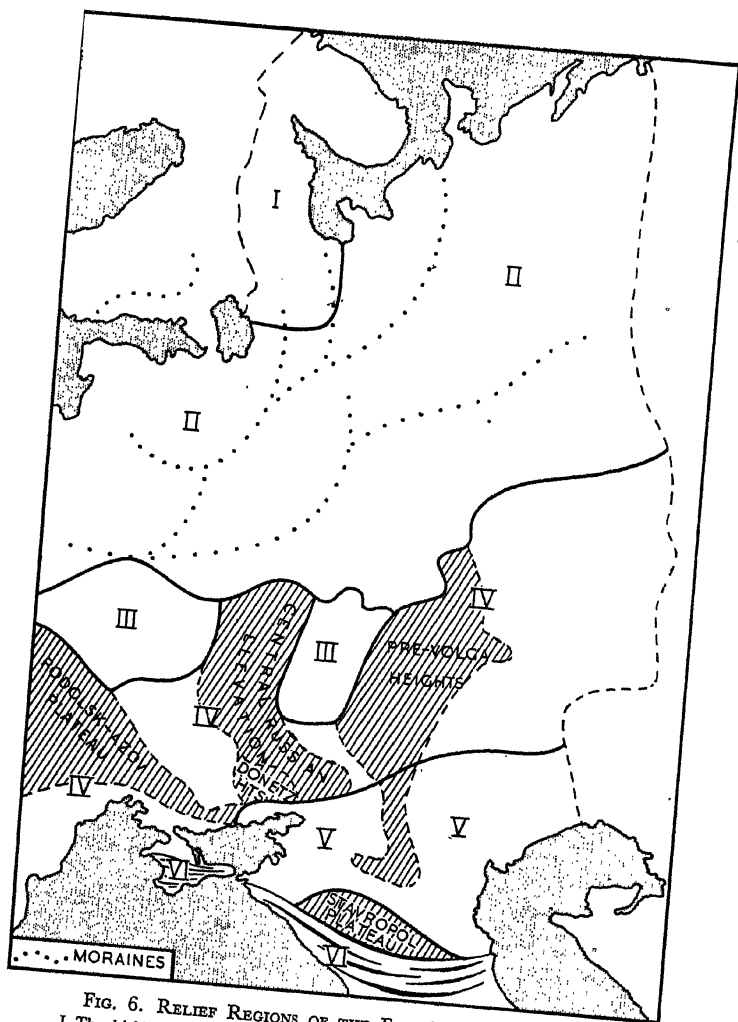


FIG. 6. RELIEF REGIONS OF THE EAST EUROPEAN PLAIN
 I, The shield land of Karelia; II, the morainic-fluvio glacial plains; III, the
 marshy depressions of the Upper Don and Dnieper; IV, the southern and
 eastern plains and uplands; V, the Caspian-Kuban depression; VI, the
 Crimea-Caucasus regions.

(a) THE WEST ASIATIC LOWLAND

(1) *The West Siberian Lowland.* This is one of the largest level areas of the earth's surface. Its breadth, between the Urals and the river Yenesei, is about 1250 miles. It extends from the Arctic Ocean in the north to the Kazakh Uplands, the Altai foothills, and Turgai Plateau in the south, a distance of from 1000 to 1600 miles. Throughout its enormous extent, there are no great elevations or steep slopes. At the confluence of the river Irtysh with the Ob, the height of the latter river is only 200 feet above sea-level. Between the former river and the Ishim the land rises to only a little above 370 feet, while low ridges between the Ob and the Irtysh rise to a height of between 15 and 35 feet above the surrounding countryside. Throughout the greater part of this lowland there is nothing to break the monotony of the landscape. The Trans-Siberian Railway runs across it for hundreds of miles in an absolutely straight line.

Having been submerged beneath the sea for long periods ranging from very early to Quaternary times, the lowland is covered with horizontal sedimentary deposits, undisturbed by folding, of the Tertiary and post-Tertiary periods. In the basin of the lower Ob there are some limestone strata of Mesozoic origin. Evidence of glacial deposits is found as far south as 61° N.

Probably owing to the dry climate, the thickness of the ice of the Quaternary glaciation was not so great as in the East European Plain. It spread out from two centres, one in the Northern Urals and the other in the Taimyr Peninsula. The effects of glaciation can be seen in the northern part of the lowland, in the form of long, low hills, with gentle slopes and very slight elevation, with shallow depressions between them. But in the Far North most of the glacial deposits were washed out by the waters of a marine transgression which occurred after the end of the Great Ice Age, or were covered over by marine deposits of this transgression.

This accounts for the extremely level surface, occupied largely by extensive areas of bog and marsh, frozen over in winter and impassable in summer.

To the south of the West Siberian Lowland there was a limited advance of an ice-sheet from the Altai Highlands. The waters which flowed from the melting edge of the ice brought deposits of clays and sands to the south-east corner of the Lowland.

Owing to the low elevation of the surface and the immaturity of the river net, very little erosion or dissection has occurred as the result of river action.

(2) *The Turgai Plateau.* This region lies between the south-west corner of the West Siberian Lowland and the Turkestan Lowland. Its surface consists of eroded horizontal Tertiary and Quaternary sedimentary deposits, which form a number of separate low plateaux, generally not more than 320 to 650 feet in height, although rising on the Turgai-Ishim watershed to more than 950 feet above sea-level.

(3) *The Turkestan or Turansk Lowland.* This consists of an area—with a surface composed mainly of horizontal Tertiary and post-Tertiary strata—in the centre of which lies the Aral Sea. It lies to the south of the Turgai Plateau and to the north of the mountains and plateaux which border Southern Turkmenistan. It is continued in the depression along the eastern shores of the southern half of the Caspian Sea.

Owing to its desert climate and its freedom from the effects of glaciation, this region has been subject mainly to the action of the winds rather than to the erosive action of rivers. Thus æolian forces have worn away the surface into sands which constitute the Kizil Kum and Kara Kum deserts. There are extensive sand-dune formations, some stationary and some moving. The latter, named Barkhani, reach a height of from 15 to 45 feet. In some areas the sands represent alluvial deposits from the beds of old rivers.

Apart from the sand-dunes, however, the level of the Lowland varies considerably. In some parts low, flat-topped, steep-sided clay hills, with clay plains between them, are prominent features (*e.g.*, in the lower Amu Darya basin). The Kara Kum and Ungus Plateaux rise in the south to a height of 650 feet above sea-level, while that region known

as the 'Hungry Steppe' has a general elevation of from 780 to 940 feet.

Æolian forces have carried away the surface deposits, in the form of fine particles of yellowish dust, depositing them in the valleys and along the foothills of the mountains of the south, in the form of loess. Consequently these valleys possess a rich soil of great importance to agriculture, wherever water can be obtained for irrigation.

(4) *The Ust-Urt Plateau.* This plateau lies between the shores of the Aral and Caspian seas, being separated from the former by steep escarpments. It is composed of horizontal strata of sedimentary rocks belonging to the Tertiary period. Its average height is about 650 feet above sea-level.

(b) THE NORTH SIBERIAN LOWLAND AND THE KOLYMA DEPRESSION

This Lowland is a continuation of the northern portion of the West Siberian Lowland, along the edge of the Central Siberian Plateau. It is constructed from sedimentary rocks of the Mesozoic period and from deposits of the post-Tertiary marine transgression (described above in connexion with the West Siberian Lowland). It is continued southward in the Lena valley and middle Lena basin, separated by mountains from the similar but smaller depression of the middle Amur basin.

The Kolyma depression contains some areas of considerable altitude, such as the Yukagir and the Alazei Plateaux. The region is continued to the north in the New Siberian Islands.

The Alazei Plateau has a general elevation of from 650 to 1300 feet above sea-level. To the east of it stretches the Kolyma Lowland, the surface of which is composed of post-Tertiary deposits.

Between the river Kolyma and its tributary the Omolov lies the Yukagir Plateau, at a height of 1300 feet north of the river Berezovka, while in several parts it rises to 2000 feet. There are occasional outstanding heights of more than 3900 feet above sea-level.

The plateau surface consists mainly of both Palæozoic and Mesozoic formations. Separate granitic massifs form the higher parts of the tableland, while the Mesozoic strata are generally in the form of horizontal deposits of marine Triassic origin.

THE MOUNTAIN SYSTEMS OF THE U.S.S.R.

The mountains of the U.S.S.R. occupy about one-fifth of its territory, and are of great value as sources of hydro-electric power and minerals.

Those elevations caused by the raising up of portions of the ancient crystalline platforms, or by tectonic movements and dislocation of their surface, have already been described (see pp. 22-27).

In the Russian Plain the rigidity of the ancient platforms resisted folding, and they were affected only by tectonic dislocation. Around the edges of the platform, however, the crust of the earth was folded up against the rigid rocks. This occurred in three main phases: (1) The Caledonian phase, commencing in Silurian times; (2) the Hercynian phase, commencing during the Carboniferous period and continuing in Permian times; (3) the Alpine phase, commencing with tectonic movements during the Jurassic period but not fully developing until the Tertiary period.

In many cases mountains founded in ancient (pre-Cambrian) times were denuded and worn down, only to be refolded and altered by dislocation at a later period. It seems that the mountains along the Asiatic frontier of the Soviet Union, from the Altai to beyond Lake Baikal, and along the western edge of the Central Siberian Plateau, continuing in the Taimyr Peninsula, must have been formed in this way, and therefore represent an ancient and denuded mountain system, regenerated in the Caledonian period of mountain formation.

Mountains formed during the Caledonian Period

A chain of mountains, composed of hard, ancient rocks, folded during the Caledonian period, stretches along the

western edge of the Baltic Shield, on the western coast of Norway. It then turns eastward and reappears as a small fragment in the Rybachi Peninsula, again on Kildin Island, and in the Kanin Peninsula north-east of Archangel, and finally appears as a chain of 'relic mountains' running in a south-easterly direction from the peninsula. These mountains are known as the Timan Range (see Figs. 2 and 4).

In the Kanin Peninsula the land rises in a flat-topped, horst-like block, with a maximum height of nearly 600 feet and composed of metamorphic rocks, mostly covered with morainic clays. It is separated from the Timan Range by a depression of the graben type.

The Timan Range. This ancient mountain chain has been so denuded that only relics of the five original parallel ranges are discernible. These remnants are flat-topped and of gentle slope, with Quaternary deposits filling the valleys. The highest points attain an elevation of about 1000 feet. The low range which joins the Ural foothills in the south-east separates the Pechora and the North Dvina basins, which are connected by transverse valleys, making feasible portage routes.

The Taimyr Peninsula. The Biranga Plateau of the Taimyr Peninsula is a block of ancient rocks, folded in pre-Cambrian times, denuded and again dislocated and fractured in the Caledonian and Hercynian periods. It reaches a height of 1970 feet and is continued in Novaya Zemlya.

The Central Siberian Plateau. The Central Siberian Plateau consists of almost horizontal Palæozoic strata laid down upon the ancient continental platform. The ancient rocks appear at the surface along the southern and western edges and also in a small area in the north (see Fig. 2). Although the plateau was raised up towards the end of the Palæozoic period, so that forces of erosion and denudation, working over a long period, have dissected the surface into valleys with areas of highland lying between, the most prominent heights are formed by the exposures of ancient rocks. Folding took place in pre-Cambrian times. A period of denudation and erosion followed, and this was succeeded by another period of folding, fracturing, and dislocation in the Caledonian period which

affected both the edge of the plateau and the land lying to the south of it.

During the Carboniferous period, depression of the land in the Lower and Stony Tunguska river basins, and invasion by the Carboniferous sea, continued in the Permian period, resulted in the formation of the Tungus coal basin. This region remains as a relatively low part of the plateau.

The Caledonian mountain-building processes were responsible for the formation of the following mountain formations: (1) The Vilui and Potorana Highlands in the north; (2) the Yenessei Heights, which rise steeply to more than 3500 feet above the right bank of the middle Yenessei; (3) the outer highlands of the Sayan system, rising to over 6000 feet between the Upper Yenessei and Angara rivers; (4) the highlands on either side of the upper Lena (1000 to 3000 feet); (5) the mountain and plateau country lying to the north of Lake Baikal, between the upper Lena and the source of the river Aldan (1200 to 6000 feet); (6) the Tungus Mountains and their extension across the watershed between the Lower Tunguska and Vilui rivers (2000 to 3400 feet).

The remainder of the plateau varies in height from 900 to 1200 feet above sea-level.

It should be noticed that many of the mountains do not reach very great altitudes, and when we take into consideration the fact that they rise from a plateau surface the altitude of which may be 1000 feet or more, it will be clear that the relative height of the mountains is not very great. Mountains formed in early times also exhibit rounded heights or plateau surfaces, rather than steep crests and peaks.

The Sayanid System of Highlands. This system of highlands extends from the upper Amu Darya basin, in the west, to the watershed between the river Aldan and the river Zeya (a tributary of the Amur) in the east. It separates the Soviet Union from Mongolia.

The ancient rocks of this system, folded and dislocated in Caledonian times, in some parts uplifted and rejuvenated at a later period, in others peneplained, show a general independence of the original direction of the mountain chains

caused by the folding, while the mountain-tops have a tendency to be of a similar height. These phenomena are, of course, the result of long-continued denudation and erosion.

These mountains form the sources of all the great Siberian rivers. The valleys between the foothills and lower ranges have forested slopes, while the valley bottoms are covered with steppe and meadow, supporting small cattle-rearing and farming communities.

Both intrusive and sedimentary rocks occur in these highlands, and the former especially have given rise to the formation of a great variety of minerals, including zinc, lead, mercury, antimony, arsenic, etc.

The Sayanid system may be divided as follows:

- (1) The Sultan-Uiz-Dag and heights of the Kizil Kum region.
- (2) The northern chains of the Tian Shan.
- (3) The greater part of the Altai, the Sayan Mountains, and the Trans-Baikal highlands.

The Altai¹ consist of a great highland block of ancient rocks, considerably fractured and denuded. Between the smooth slopes of the foothills there are deep, mature valleys, while the snow-capped heights rise to heights varying from 12,000 to 14,000 feet. Two ranges branch off from the main highland mass in the north—the Kuznetsk Alai Tau, and the Salayir Range. The Kuznetsk coal basin lies between them.

As the surrounding mountain ridges were raised up during the lower Palæozoic epoch, the land between them sank to form a basin which, at the beginning of the Devonian period, became part of the Uralo-Siberian Sea. In the Carboniferous period it became separated from this sea and formed a wide expanse of bogs and lakes, flooded by large rivers which brought down great quantities of mud and sand. The ground was covered with thick tropical vegetation, the organic matter

¹ The south-west part of the Altai is not included in this system. According to the Russian geologist Nekhoroshev, this south-western region did not exist as a mountain system before Tertiary times, but was formed by dislocation of the earth's crust at the end of the Tertiary and the beginning of the Quaternary periods.

from which provided the basis for the formation of coal. This process continued into the Permian period.

Between the Altai and the Central Tian Shan Ranges, intersected by the Ektag Altai, the Targabat Altai, and the Alai Tau Ranges, lies the Dzungarian Gate, which formed the traditional way into Europe from China in very early historical times.

It is divided by the mountains which intersect it into three major depressions:

- (1) The Irtysh and Urunga valleys.
- (2) The Sassik-Kul, Zaisan, and other lake depressions, which together lie on the floor of the "Dzungarian Strait."
- (3) The Chuguchak valley.

To the north of the Dzungarian Gate lie the Altai, and the mountains and plateaux of Central Siberia, composed of ancient and Palæozoic rocks, while similar rocks make up the Tian Shan Ranges to the south.

Between these masses of ancient rocks, the floor of the depressions is covered with post-Tertiary deposits, continued westwards in Kazakhstan and West Siberia, and to the east in Sinkiang. Thus geologically the Dzungarian Gate is an old strait, while historically it forms the gateway through which the poor steppe land continues eastward from the lower Volga into Sinkiang and the Gobi Desert—the great grassland gateway into Europe followed by early nomadic migration and invasions, and later by caravan routes.

The Sayan Mountains stretch eastward from the Altai towards the south end of Lake Baikal. The highest ranges of the western end reach 8000 feet above sea-level. In the east there are points higher than 10,000 feet.

The Sayan Ranges, formed during the Caledonian period, were denuded, and later again raised up, *en masse*. The tops of many of the ranges, like those of the Altai, possess a plateau surface. The intrusive rocks of this system contain gold, silver, and other minerals.

The Western Part of the Trans-Baikal Highlands. The high-

lands to the east of Lake Baikal consist of a number of plateaux with an elevation of over 3000 feet above sea-level. Relatively slight upswellings of the land—the result of erosion and denudation due to weathering and river action—break the general level of the country. These highlands have the appearance of a number of flat, forested massifs, separated from each other by deep, wide, mature valleys. The mountain ridges, all of a similar height (up to 8000 feet), run across the plateaux in a direction from south-west to north-east. The Yablonoï Range forms the eastern boundary of this region.

The construction of the country is due largely to the fracture and dislocation of the ancient rocks into a number of massive blocks of the horst type. Other portions have sunk to form graben. The trough occupied by Lake Baikal is one of the finest examples in the world. The lake has a maximum depth of 5712 feet.

The greatest altitudes in this region are a little more than 8000 feet above sea-level. Like the Olekhma-Vitim Plateau, these highlands contain valuable auriferous deposits.

The Olekhma-Vitim Mountain and Plateau Country. This region extends between the rivers Olekhma and Vitim. The construction and appearance is similar to that of the Trans-Baikal Highlands, described above. It is more dissected by river valleys, but there is not such a great abundance of mountain ridges.

The Stanovoi System. These mountains were originally formed during the Caledonian period, but were in part covered with later deposits and again subjected to intense disturbance. The Stanovoi system consists of a number of ranges of high mountains, rising to 8000 feet above sea-level and swinging in a great arc around the south-eastern and eastern edge of the Central Siberian Plateau. In the south it divides the Amur basin from the Lena basin, while farther north it forms the watershed between the right bank tributaries of the river Aldan and the Sea of Okhotsk.¹ Its northern

¹ The middle portions of the Lena and Amur basins formed depressions which were subjected to marine transgression in the Mesozoic period. (See p. 44.)

extremity joins the centre of the great arc of the Verkhoyansk-Kolyma-Anadyr mountain system, from which the Yana, Indigirka, and Kolyma rivers flow to the Arctic Ocean.

Another mountain system originating in the Caledonian period and subjected to disturbance and folding in later periods was discovered and explored by Obrutchev's expedition in 1926. This is the Cherski Range—probably the last of the world's great mountain chains to be discovered. Over 9000 feet high, it is the inner, central range of a system of three arcs of mountains, running parallel to the Verkhoyansk-Kolyma-Anadyr system. (See p. 54.)

Mountains formed during the Hercynian Period

The Uralid System. The mountain-building processes of this system took place in the interval between the end of the Devonian period and the beginning of the Triassic period.

The system consists of certain ranges of the Urals, and their extension southward towards the Aral Sea, in the Mugodzhzar Hills, the middle ranges of the Tian Shan, on either side of the Narin, Ferghana, and Zeravshan valleys, the South-western or Rudny Altai, and others. In the Tian Shan mountains it is difficult to separate the Uralid from the Sayanid systems.

The Kazakh Highland. This region lies between the West Siberian Lowland and Lake Balkhash, extending from Ulu Tau Range (3700 feet) in the west, to the upper Irtysh and the Altai in the east. It consists of a number of separate, disconnected, low massifs, formed by the dislocation of Palæozoic strata. The greatest elevation is attained in the centre of the region, near Karakalinsk, where the land rises to more than 4800 feet above sea-level.

Some of the strongest dislocation of the region took place during the lower Palæozoic period—that is to say, not during the Hercynian phase of mountain formation.

Although to-day the higher massifs rarely exceed in elevation 3000 feet above sea-level, the Kazakh Uplands originally consisted of high mountain ranges. They have been almost

completely denuded, with the result that an amazing amount of mineral wealth has been revealed close to the surface—coal (at Karaganda), zinc, lead, and gold, for example, while the greatest deposits of copper in the U.S.S.R. are found here, and are being worked close to the shore of Lake Balkhash and near Dzhezkazgan.

The Donetz Heights. The effect of the Hercynian folding and dislocation in this region has already been described (see p. 26).

The Urals. During the Carboniferous period the Ural-Tian Shan geosyncline, which had been covered by the Devonian sea, became the arena of the Hercynian mountain-building process. The crust of the earth was folded against the eastern edge of the platform upon which rested the East European Plain, forming the Ural Mountains. This system runs in a general north-south direction for about 1500 miles. The folding process, strongest in the upper Carboniferous period, was brought about by pressure from the east. This resulted in greater fracturing and dislocation on the eastern slopes, which rise more steeply from the plain than in the west. For the same reason the eastern slopes display many igneous and metamorphic intrusions, while sedimentary rocks, crushed between the folds, often appear as 'islands'.

The Permian sea, much narrower than the Carboniferous sea, and covering only the eastern part of the East European Plain, gradually dried. The extensive Permian sandstones which cover much of the western slopes of the Urals contain valuable deposits of rock salt, potassium salt, and copper ores.

Since the Carboniferous period the Urals have been subjected to continuous denudation which rounded off the heights and exposed mineral deposits. Hard crystalline rocks are most prevalent in the north, so it is here that the highest part of the range is found. The extreme northern part is narrow, and broken by transverse valleys, but south of the Arctic Circle it broadens out and consists of several parallel ranges, two of which have peaks over 5000 feet high. In the northern half of the Urals, which was subject to the Quaternary glaciation, glacial valleys of the Alpine type are common.

The Central Urals were less resistant, and several of the original upfolds have disappeared. The highest point attains an elevation of only 2600 feet above sea-level. Gently rounded contours characterize this section, which varies in width from 12 to 20 miles, but is no barrier to movement, as passes are low. With the intrusive rocks which are common in the eastern slopes of the Central Urals are associated large deposits of iron, copper, chrome, gold, platinum, etc. Farther west, where sedimentary rocks are more prevalent, coal, oil, potassium salts, and phosphates are the most important minerals.

Several parallel ridges appear in the Southern Urals. All have been extensively eroded, except the westerly range, which is composed of harder material and attains 5000 feet. South of 52° N., this higher land gradually gives way to low, undulating country covered with material of relatively recent origin, chiefly Quaternary loess and clays, and traversed by the Guberlinski, Mugodzhhar, and other low ranges, generally broken into a number of separate hills, below 2000 feet.

The Mesozoic and Tertiary Folded Mountains of Eastern Siberia

In the peripheral areas of Eastern Siberia there are five groups of mountains in which folding and dislocation took place during the Mesozoic period and partly during the Tertiary period. They are as follows:

The Eastern Part of Transbaikalia. This is a plateau region, traversed by several more or less parallel ridges, running from south-west to north-east, and lying between the Yablonoi Range in the west and the Bolshoi Khingan in the east. Between the mountains are the valleys of the Shilka and Argun rivers, tributaries of the Amur.

The Bureya Mountains. These mountains, often named the Maly Khingan, reach heights of 6500 feet. Between them and the Bolshoi Khingan lies the Zeya-Bureya Plateau, along the southern edge of which is the Amur valley.

The Sikhote Alin Range. The Sikhote Alin Range forms a

difficult barrier between the Pacific coast of the Far East and the plains of the Amur and Ussuri valleys. There is only a very narrow coastal strip between the foot of the mountains and the sea. In addition to forming a barrier to communications, these mountains also form an important climatic barrier. The foothills are low, with gentle slopes, showing evidence of denudation and erosion, and from the mountain-tops the Pacific slopes have the appearance of gently rolling forest lands. The average height of the range is about 2700 feet, but the highest points exceed 6000 feet.

In the southern portion of the range, on the eastern slopes (*i.e.*, north-east of Vladivostock), lead, zinc, coal, and other minerals are mined.

The Mountain Ranges of Sakhalin. A depression runs meridionally through the centre of the island, and on either side a range of mountains rises, attaining a height of 6500 feet in the east. Oil is found on the flanks of the western range.

The Verkhoyansk System. This system consists of a large number of mountain ranges, arranged in four parallel arcs, nearly 300 miles wide. The outer, southern arc, composed of the Verkhoyansk and the Kolyma Ranges, continues towards the north-east in the Anadyr Range.

The western part of the Verkhoyansk Range is composed largely of pre-Cambrian and Silurian rocks, intensely folded and fractured, while in the east the earlier formations are covered by strongly dislocated formations of marine Triassic origin. The greatest heights are about 8000 feet, and the slopes bear traces of at least two glaciations.

The recently discovered Cherski Mountains consist of nine parallel Alpine chains, rising to 10,000 feet in some parts, over 600 miles long and 190 miles wide. Together with ranges lying to the east they form the inner central portion of three mountain arcs which run parallel to the Verkhoyansk-Kolyma system. They are considerably higher than the latter. The Cherski highlands form a horst, uplifted in recent times and composed of intensely folded Triassic strata lying above folded Palæozoic formations. There are also some patches of lower Cretaceous or Jurassic deposits. Prior to

the exploration of this region in 1926 it was thought that the Kolyma Range ran parallel to the northern shores of the Okhotsk Sea, while the Cherski Range was unknown. It is now established that the watershed between that sea and the north-flowing Indigirka and Kolyma rivers is largely composed of branches of the Cherski and Tas Kistabit Ranges, while farther along the coast the Gidan Range commences, and attains a height of 6500 feet.

In the extreme north-east the Anadyr Range (7500 feet) forms the watershed between those rivers flowing into the Arctic Ocean and the Anadyr river, which flows into the Behring Sea.

Kamchatka. Two parallel ranges, formed rather later than the Sikhote Alin, run in a north-north-westerly direction through the peninsula. The western range possesses the Ichinska, or Belaya volcano, with a snow-capped peak reaching a height of over 12,000 feet. Between this range and the Okhotsk Sea lies the coastal Tundra region, at a height varying from 1900 to more than 2400 feet. Along the eastern side of the ranges overlooking the Behring Sea there is a row of volcanoes, some of which are active. The famous Kliuchevski peak (15,940 feet) rivals the Japanese Fuji Yama in its grandeur and majesty. Its last eruption occurred in 1932. Several of the Kamchatkan volcanoes bear glaciers on their slopes. The presence of active volcanoes and the occurrence of earthquakes are phenomena typical of a region of young folded mountains.

The Mesozoic Folds of Western Asia

The Džžanak Mountains. These mountains lie close to the Caspian Sea, between the south-east corner of the Kara Bogaz Gol bay and the western escarpment of the Ust-Urt Plateau. They reach a height of over 1300 feet, and are continued in the Mangyshlak Range to the north-west.

The Krasnovodsk Plateau. This plateau lies to the south of the Džžanak Mountains, and consists of a great thickness of Jurassic limestone and chalk, rising to almost 1000 feet. At

its eastern end the Great Balkhan Mountains rise to over 6000 feet. They continue south-eastward, towards the Kopet Dag, in the Little Balkhan.

Folded Mountains of the Alpine System

CENTRAL ASIA

In the Central Asiatic part of the Soviet Union the mountains of the Alpine system extend from the Caspian Sea to the Sinkiang frontier and are represented by the Little Balkhan, the barren and rocky Kopet Dag, the Paropamiz, the southern ranges of the Tian Shan, and the lofty Pamir.

The Little Balkhan Range lies south of the Krasnovodsk Plateau and rises to more than 3000 feet. To the south-east are the Kopet Dag Mountains, the greater part of which lie across the Turkmen frontier, in Iran. Within the Turkmen Republic they reach a height of nearly 9000 feet. They are constructed of Cretaceous and Tertiary strata, folded and dislocated in Pliocene times.

Farther to the east the Paropamiz also lie close to the Turkmen frontier. They represent outliers of higher ranges to the south and do not rise above 4000 feet.

To the north of the upper course of the Amu Darya on either side of its tributary, the Vakhsh, lie the southern chains of the Tian Shan, with the Gissarski, Peter the Great, and Darvazski Ranges rising to more than 18,000 feet. The highest point, Mount Stalin, has an elevation of 24,590 feet above sea-level. In this region, to the east of the Academya Range, lies the Muk-Su basin, containing the largest glacier in the world (with the exception of Arctic glaciers). This is the Fedchenko Glacier, nearly 50 miles in length. All the chief rivers of Soviet Central Asia originate in valley glaciers, and their life-giving waters irrigate the arid plains. The Tian Shan Ranges also enclose a number of lakes, such as Lake Karakul, more than two miles above sea-level (the second highest lake in the world), and Lake Issyk-Kul, in the Kirghiz Republic, nearly half a mile deep and 250 square miles in area.

To the south of the Tian Shan, the highland frontier region of Soviet Central Asia is continued in the Pamir. The Pamir might well be called the roof of the Soviet Union. This highland mass forms a nodal point from which the Tian Shan branch out to the north and the Hindu Kush to the south. It is the watershed for the whole of Central Asia, and lies at a height of over 13,000 feet. Mount Lenin rises in the north to 23,680 feet, the Vakhanski Range exceeds 19,500 feet and the Pamirski Range 23,000 feet. The Pamirs, like the Kopet Dag, have barren, rocky slopes, and contain several large glaciers. The great altitude is the cause of the severe climate. Only two months of the year are free from frost.

THE CAUCASUS AND THE CRIMEA ¹

The Caucasus

The Caucasian mountain system forms a bridge some 750 miles long between the Black Sea and the Caspian Sea. It may be divided as follows:

The Pre-Caucasus Upland. This upland region rises gently from the south of the Manych depression and runs parallel to the main range of the Great Caucasus. The highest part of the elevation is the Stavropol Plateau (1950 to 2600 feet).

The Pre-Caucasus Depression. This depression lies between the pre-Caucasus elevation and the foothills of the Great Caucasus. It is a geosynclinal downfold, interrupted towards its western end by an elevation caused by tectonic dislocation, which seems to have run from the Ergeni Hills through the Stavropol Plateau to Mount Elbruz. This elevation divides the depression into the Kuban basin on the west and the Terek basin on the east. These basins have level floors, covered by Quaternary deposits.

The Great Caucasus. The main mountain system consists of a number of ranges, some parallel to each other and some transverse, with heights varying between 9000 and 12,000 feet. The greatest heights are attained in the central range, which is composed of hard crystalline and metamorphic material,

¹ See also Chapter XVI.

while to the east and west softer rocks, especially limestones, prevail. Eleven peaks exceed Mont Blanc in height. The two most outstanding, Mount Elbruz (18,470 feet), of volcanic origin, and Kazbek (16,546 feet), lie to the north of the central ranges. Near Mount Elbruz is the widest part of the Caucasian mountains—about 100 miles from north to south.

The region of permanent snow begins at an altitude of between 8000 and 11,700 feet, and it is here that the great Dikh-Su Glacier lies—more than 9 miles in length. The snow and ice of the main Caucasian ranges feed a number of powerful rivers, of great value as sources of hydro-electric power. In the period of mountain folding, when these ranges were formed, magmatic intrusions played an important rôle, and are responsible for the presence of such minerals as zinc, gold, silver, molybdenum, wolfram, etc.

The sedimentary rocks which flank the main Caucasian ranges to the north contain oil-bearing strata, while the manganese ore of the Chiaturi district is of sedimentary origin.

To the south of the main ranges there are two important regions of tectonic subsidence, the depression of the Rion valley on the west, and the Kura-Arax depression on the east, running down to the Black Sea and Caspian Sea respectively. These lowlands are separated from each other by the Suran Range, which also connects the Great Caucasus with the Little Caucasus, a mountainous country lying between the depressions named above and the Soviet frontier with Turkey and Iran. The eastern end overlooks the Arax valley, a southern extension of the Kura depression.

Towards the south-west, the Little Caucasus joins an extension of the Armenian mountains and plateaux. The plateau landscape of Armenia is in some parts reminiscent of the Kuban steppe—open, level country, frequently dissected by ravines. In this region there are many examples of the volcanic action usually associated with the Alpine mountain-building process. The mountains consist of parallel and intersecting ranges, with closed or interlocking circular valleys, crater-like in appearance, the hollows often being occupied

by lakes. The average height of the plateaux is from 5000 to 7000 feet. The highest point, the two-headed volcanic mountain, Mount Ararat (16,920 feet), lies in Turkey.

Stretching across an historic land route between Europe and the East, the Caucasus has been the scene of many violent battles in the past, while the mountain valleys, shut off from one another by the surrounding heights, favoured the development of numerous small isolated mountain communities, each with its own national territory, customs, traditions, and language.

The Crimea

The Crimea is a region which was folded in ancient times, reduced to a peneplain, submerged under the sea, and raised and folded again in Tertiary times.

Stretching across the southern part of the Crimean Peninsula, for a distance of about 65 miles, the width of the mountain zone is approximately 20 miles.

There are three parallel ridges, the Yaila ridge in the south being the highest. The top of this ridge is flat or slightly undulating, and is composed of calcareous strata of the Jurassic period. There is an abundance of karst formation: numerous steep-sided valleys, pot-holes, and disappearing streams. The surface is dry, and covered with a thin steppe vegetation. ('Yaila' is a Tartar word, meaning 'pasture.') The highest parts of the ridge reach 4500 to 5000 feet above sea-level.

On the southern side there is an abrupt fall to a shelf, lying about 1500 feet above the sea.

The northern slopes of this ridge are more gentle, falling gradually into a valley nine to twelve miles wide, filled with Cretaceous sands and clays. To the north of the valley, the second range rises to a height of between 1450 and 1850 feet above sea-level. It is composed of cretaceous strata, covered with limestone of the lower Tertiary period. Hewn out of the limestone are thousands of caves which were the homes of the first primitive inhabitants of the Crimea. Owing to the existence of numerous longitudinal and transverse valleys,

this ridge is characterized by several separate heights, often worn into fanciful shapes.

Separating these mountains from the most northerly ridge, there is a valley, less than three miles in width. It is followed by the road and railway from Sevastopol.

The northern ridge (500-800 feet) unites in the east, near Simferopol, with the central ridge. It is composed of limestone strata.

The extreme south-western end of the Crimean Mountains is cut off sharply by the sea. The eastern extremity, in the north-east of the Kerch Peninsula, forms rather low hills, which in turn are continued across the Kerch Strait in the western foothills of the Great Caucasus.

The Crimean Mountains, mainly composed of young sedimentary strata with no intrusive material, contain little mineral wealth, apart from the Kerch iron deposits (of sedimentary origin).

The mountains are of importance, however, owing to the fact that, like the Caucasian ranges on the eastern shores of the Black Sea, they protect the coastal lands from the cold winter winds from the Russian Plain. Hence the climate is mild, and both the Crimea and eastern shores of the Black Sea are famous for their health and pleasure resorts.

The mountains of the Alpine system offer a sharp contrast to those formed in earlier periods. The Alpine folded mountains have not been subject to denudation and erosion for such a long period. Consequently much more of the sharp features of their original relief remain—high crests, sharply defined peaks, steep-sided valleys, and so on. On the other hand, since the mountains have not been worn down to a great extent, there is not a great abundance of mineral wealth exposed near to the surface. Minerals which are found are in relatively small quantities but usually of great value (*e.g.*, gold, zinc, lead, and rare metals).

In the Caucasus, for example, minerals are confined mainly to those areas, limited in extent, where folding and subsequent erosion have exposed the older strata and magmatic intrusions

which lie beneath the younger rocks. The one great exception is, of course, petroleum, found on the flanks of the mountains in Mesozoic and Tertiary deposits. The lack of minerals is, however, compensated to some extent by the great resources of hydro-electric power available in a region where the mountains are high, the river system young, and the valley gradients steep, while the Caucasus also contains valuable forests and Alpine pastures.

The mountains of the older systems, in contrast, usually have rather low elevations, with softer contours, rounded heights, smooth slopes, the mountain tops considerably flattened by denudation. Valleys are broad and wide, typical of a mature river system. Hence, the older mountains do not usually present such a great obstacle to communications as those of the Alpine period. They are also rich in mineral wealth. Owing to long periods of denudation, large deposits of valuable minerals, particularly coal and iron, are exposed near the surface.

THE RIVERS OF THE U.S.S.R.

A country possessing a vast land-territory is indeed fortunate if, within that territory, there is a good system of navigable waterways. The Soviet Union possesses more than 180,000 miles of navigable rivers. From the earliest times these waterways were used for transport and communication, and to-day they are linked by a system of canals along which large ships can pass to and from each of the five seas of European Russia. These rivers also provide a most important source of electrical power. The Volga alone gives about one and a half million kilowatts each year.

Although the construction of canals and dams has done much to increase the value of the rivers for navigation, climatic factors still exert a great influence upon the degree of utility of any particular river. The rivers of European Russia and Siberia remain frozen during the winter. The maximum flow of water occurs during and after the floods which commence with the thawing of the ice in the spring.

The monsoon character of the climate in the Far East produces a maximum flow during the summer months, when the level of the rivers west of the Urals falls considerably. In Middle Asia the heat of the sun melts the ice and snow on the mountains in summer, when the rivers become raging torrents. The Caucasian rivers have relatively short courses between the steep mountains and the sea, and great quantities of sediments are brought down and deposited in the form of banks and islands in the middle and lower courses of the streams, obstructing their courses.

The Volga. This historic Russian river has a total length of over 2300 miles, and carries half the river freight of the U.S.S.R. It rises amid the bogs and lakes of the morainic Valdai Hills, about 800 feet above the level of the Baltic, and falls to about 80 feet below the level of the Baltic in its course to the Caspian Sea. It attains its greatest volume in the vicinity of Stalingrad. It receives most of its water, like most of the Russian rivers, from the melting snows in spring, when great floods occur. The level gradually decreases during the latter half of the summer, reaching its lowest point at the end of the winter. During the spring floods the volume of the river may be eighty times greater than that of the summer drought period. The lower course of the river retains a great volume of water for the longest period, while the ice cover does not hinder navigation for such a great length of time as in the middle and upper part. The Volga is free from ice at Astrakhan for 246 days, and at Rzhev for only 205 days. The middle and upper course becomes very shallow during the summer, and seriously interferes with shipping. Thus the lower part of the river possesses the greatest advantages for navigation.

During the nineteenth century reservoirs were constructed in the upper valley of the Volga in order to hold the flood waters in spring and provide a surplus with which to maintain the level of the river in the summer, while canals were built in order to enable small boats to pass into the Neva basin. Within recent years the Great Volga Project has been completed. Dams have raised the level of the water, and help

to maintain it during the summer. Additional supplies of water have been obtained by the construction of a great reservoir on the Kama-Pechora divide (see Fig. 48), and the Ivankov Dam has made possible the creation of the "Moscow Sea" and the ship-canal linking Moscow with the Volga. Reconstruction of the canal systems linking the Moscow with the Neva has made it possible for ships of considerable size to pass from the Volga to the Baltic Sea, while the construction of the Baltic-White Sea canal system has extended the water-communications of Moscow from the White Sea to the Caspian. With the completion of the new Volga-Don Canal Moscow will become a port of five seas.

The Dnieper. Like the Volga, the Dnieper rises in the Valdai Hills, and flows for a little more than 1400 miles to the Black Sea. Many of the tributaries of the river are navigable, and the navigation season of the lower Dnieper lasts for 280 days—a longer season than that of any other of the great Russian rivers. The lower part of the river is divided from the upper part by rapids, which have now been drowned by the construction of the famous Dnieper Dam, which has caused the level of the river to rise behind the dam by about 120 feet. Below the old rapids the river divides into numerous branches, with extensive marshy tracts on either side.

The North Dvina and Pechora Rivers. These rivers, 800 and 1100 miles long, flow across vast plains, and in common with the north-flowing Siberian rivers, they quickly free themselves from ice in the spring, and, flooded with water from the melting snows, become very turbulent and fast. They are of great importance for the floating of timber.

The Yenesei. This is one of Russia's mightiest rivers, destined to become of increasing importance and significance as the plan for the opening up of Siberia develops, with the Yenesei and the Arctic sea-route as the main transport arteries. It is one of the longest rivers in the world, having a total length of 2260 miles. It rises in the flat plateau country of the Tuvinsk Republic, and cuts through the Sayan Mountains in a series of stony gorges with steep granite sides. There are rapids below Krasnoyarsk, navigable with the

aid of steam-tugs. Below this point there is no impediment to navigation, and ships may pass freely down to the Kara Sea. The Volga is a slow-flowing river in comparison to the Yenesei. An interesting feature, in common with the other great Siberian rivers, is that the lower part remains icebound after the thaw is complete in the upper part. As a result of this, vast floods occur, and when the ice finally melts in the lower course the volume, speed, and destructive power of the river are enormous.

The ice has usually disappeared by the middle of May and there is a navigation season of five months in the upper, southern, half of the river, while the lower part can only be used for three months. During these three months the new Arctic port of Igarka is very busy. All the timber which has been cut during the winter is loaded on to ships, which have to be out of Arctic waters by the end of September at the latest.

The Ob. The Ob flows across a vast plain. Consequently it is a much slower and quieter river than the Yenesei. In the lower half of its course it divides into several channels, and there are enormous areas of permanent and impassable marshlands on either side. Its main tributary, the Irtysh, rises in China, on the western slopes of the Mongolian Altai, and in its course through the mountains is a very fast river. Between Semipalatinsk and Omsk it traverses steppe plains and, during this section of its course, receives no tributaries. It is navigable for about 2000 miles.

The Lena, Yana, Indigirka, and Kama Rivers. These rivers flow through a region of perpetually frozen subsoil and long, severe winters. Consequently the navigation season is very short, and there have been occasions when the mouth of the Lena has been blocked with ice throughout the summer. Although the Lena is 2767 miles in length, and navigable as far as Katun, it is not likely to attain the importance of the Yenesei as a commercial highway.¹

The Amur. The supply of water to this river depends not so much upon the melting of the snow in spring as upon the

¹ The Lena is the longest river of the Soviet Union, and the area of its delta is three times that of the Volga.

amount of summer rains. The river reaches its highest level in July or August. The Amur has its origin at the junction of the Argun and Shilka. Its total length is 1485 miles, or, together with the Argun, 2780 miles. The upper part of the course lies between high, forested banks. The middle section has lower banks and the river broadens out to a width of two and a half miles. It cuts through the Mali Khinghan Mountains in a rather narrow gorge, and consequently the width is reduced to about 700 yards. Below Khabarovsk it increases to from one to three miles. At its mouth the distance across the river is more than nine miles.

The Amur provides an excellent waterway for ocean ships along its lower course up to Khabarovsk. Here the ice-free season lasts for seven months.

The Amu Darya. Although the Amu Darya is 1470 miles in length, its main importance does not lie in its usefulness for navigation. It runs through desert country and provides water for the irrigation of large tracts of land. For this reason it has been called "The Nile of Russia." It rises at a height of nearly 16,000 feet in the Hindu Kush Mountains and receives about 50 per cent. of its water from melting glaciers, so that it contains most water during the summer—that is to say at the time when it is useful for agriculture. The summer floods wash away the banks and the river carries a heavy load of sediments, which give it its characteristic dirty yellow colour. Although this alluvial silt creates difficulties for navigation, increased by the constant changing of the channel, it increases the fertility of the land which it floods to a very considerable extent. There are two flood-periods—one in the spring, when the mountain-snows melt (April–May), and the other during the hot, dry season in June and July. The latter flooding is the greater of the two, the level of the water rising in the middle course of the river more than six feet above its normal level.

The lower part of the Amu Darya is covered with ice for two to two and a half months (from December to February). The ice, however, is not very thick, and only attains a thickness of 9 to 11 inches in extremely cold weather.

There are a number of other Asiatic rivers, such as the Syr Darya, which bring life to the desert. They all have a similar regime to that of the Amu Darya, although the smaller streams sink into the sands before reaching the Sea of Aral.

The Caucasian Rivers. The Terek, Sulak, Kura, and Arax have a regime similar to that of the rivers of Middle Asia. The Kuban is used by small vessels for navigation. The most important asset of these Caucasian rivers, however, is their value as sources of hydro-electric power. This is equally true of several of the Asiatic rivers.

BIBLIOGRAPHY

Russian

- N. N. BARANSKY: *Physical Geography* (Moscow, 1939). Textbook for middle schools.
 L. C. BERG: "The Relief of Siberia and Central Asia," in *Rastitelnost S.S.S.R.* (Moscow, 1938), vol. i.
 C. A. YAKOVLYEV: "Geomorphology and Construction of the European Part of the U.S.S.R. and Adjacent Territory," in *Rastitelnost S.S.S.R.* (Moscow, 1938), vol. i.

English

- S. V. CHEFRAMOV: *Physical Geography of the U.S.S.R.* (Moscow, 1937).
 S. V. OBRUTCHEV: "Discovery of a Great Range in North-east Siberia," in *Geographical Journal*, vol. lxx, No. 5 (1927).
 M. P. POTEMKIN and V. V. MALINKO: *Mineralogy and Geology* (Moscow, 1936).
 M. ROMM: *The Ascent of Mount Stalin* (Lawrence and Wishart, 1936).

French

- V. DE LA BLACHE et L. GALLOIS (editors): *Géographie Universelle*, volume vi. *Les États de la Baltique et la Russe* (P. Camena d'Almeida, Paris, 1932).

NOTE: The works quoted above have also been used as sources of information for subsequent chapters.

CHAPTER II

Climate

THE U.S.S.R. is a huge land mass—eight and a half million square miles in area—situated in middle and high latitudes. Its position would ensure an extreme climate, and this is intensified by the limited influence of the surrounding oceans. Of this area, 73 per cent. is more than 250 miles from seas which are either enclosed (*e.g.*, Baltic, Black, Caspian) or frozen for long periods (*e.g.*, the Arctic Ocean) or have cold currents near the coast (*e.g.*, the Pacific). Moreover, the mountainous barrier of the South shuts off warming winds from lower latitudes, and the ranges of Eastern Siberia confine Pacific influences to the coast.

Thus, in general, the summers are hot and the winters intensely cold, so cold that the normal high-pressure belt of sub-tropical latitudes is intensified to produce some of the highest readings in the world. The centre of this high-pressure system lies south of Lake Baikal and provides a reservoir of air which yields outflowing winds and the winter monsoons of China and Japan, but the great cold draws the system far north and the 30·2-inch isobar cuts the Arctic Circle. In Southern Russia the high-pressure area forms a ridge approximately along 50° N. which acts as a wind divide; southerly and south-westerly winds prevail in North and Central Russia, cold north and east winds in the steppes of the South. The high-pressure system persists for nearly nine months, from August to April, gradually giving way to the gentle gradients of the summer low-pressure system. North-westerly and westerly winds then prevail in North and Central Russia, while the Ukraine has north-westerly and South-eastern Russia north and north-easterly winds (Fig. 7).

These pressure conditions and the configuration of the land result in great uniformity of climate over wide areas. The prevailing westerly winds of Western Russia carry oceanic

influences as far eastward as the Yenesei, for the Urals are no climatic barrier. The general levelness of the surface gives the winds free play, especially in treeless areas. In winter the mild westerly winds are predominant in the north, while cold easterly winds blow in the south, thus tending to offset latitudinal differences; in summer the westerly winds affect

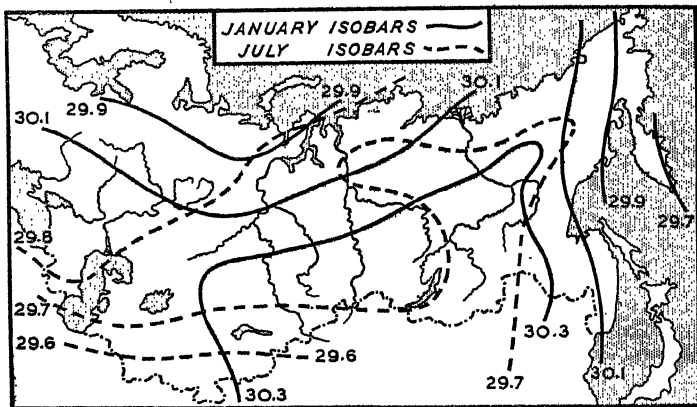


FIG. 7. MEAN PRESSURE DISTRIBUTION

a wider area, but the longer hours of daylight in the north make for uniformity. Variations in temperature from north to south are less striking than those from west to east, especially in winter. The average January temperature at Leningrad is 1.1° higher than Kursk, 500 miles farther south. Taganrog has the same January mean (-21.5°) as Vaidi Gouba, on the northern shore of the Kola Peninsula. The following table (p. 70) shows the diminution of winter temperature with increased distance eastward.

On the other hand, the duration of winter is longer in the north than in the south. The winter at Leningrad may be less cold than at Moscow, but it starts earlier and lasts longer. At Moscow the temperature is below freezing-point on the average for 151 days, at Kola for 191 days.

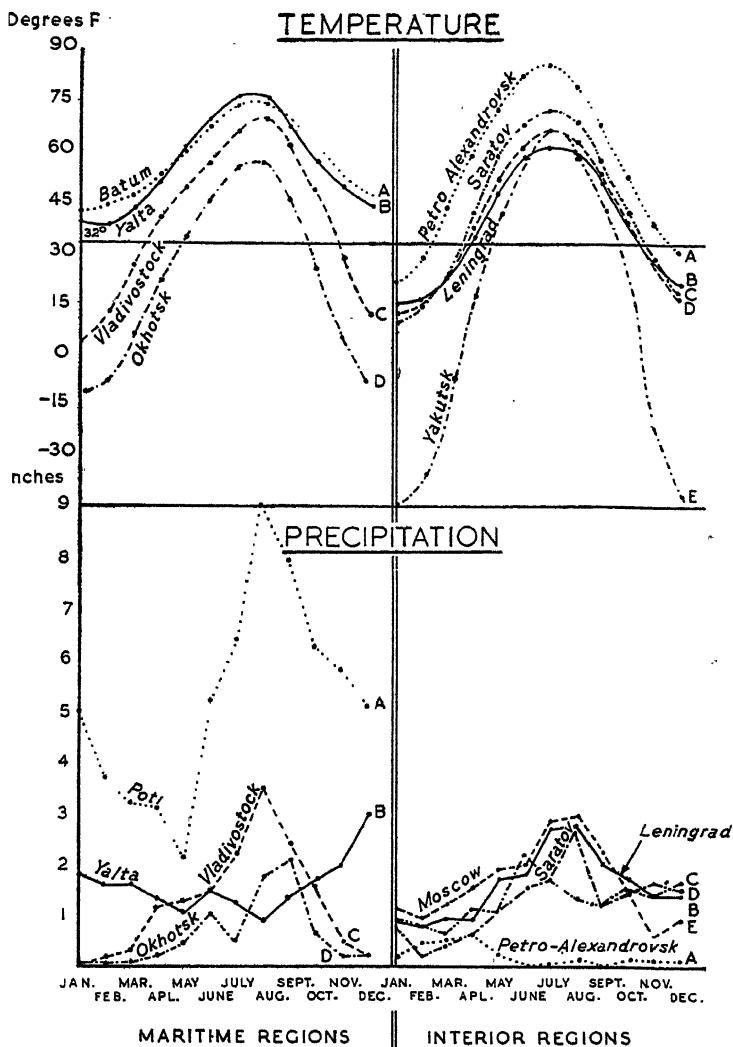


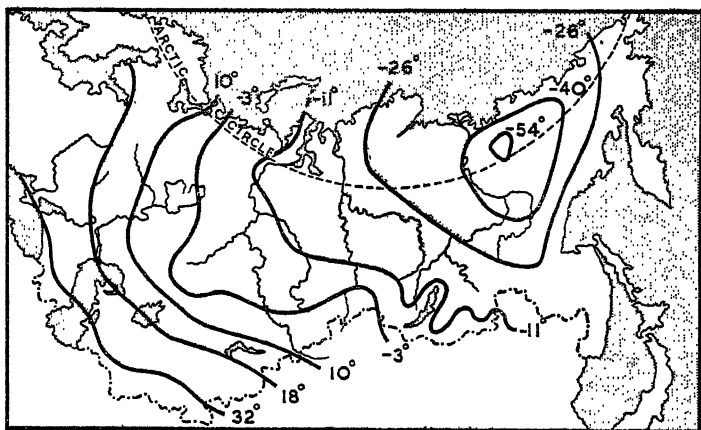
FIG. 8. MEAN TEMPERATURES AND PRECIPITATION OF
REPRESENTATIVE STATIONS

PLACE	LATITUDE	MEAN JANUARY TEMPERATURE
Moscow . . .	55° 45' N.	12.2° F.
Gorki . . .	56° N.	11.0° F.
Kazan . . .	55° 47' N.	7.2° F.
Perm . . .	58° N.	3.0° F.
Tobolsk . . .	58° 12' N.	- 2.2° F.
Tomsk . . .	56° N.	- 3.3° F.

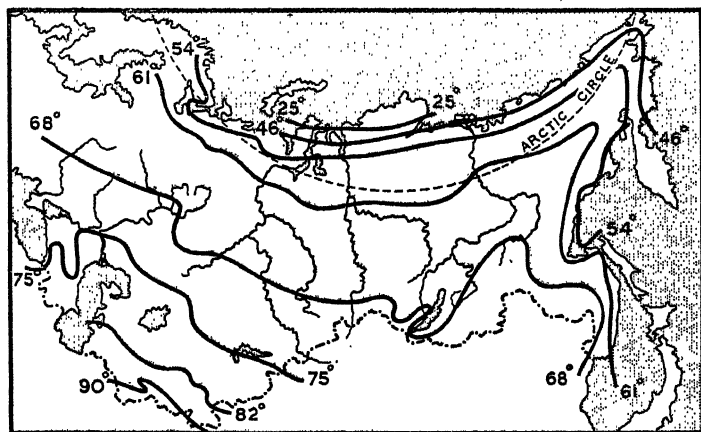
East of the Yenesei the westerly oceanic influence, though not completely absent, is much less pronounced, while the Pacific has little effect since the winds are predominantly off-shore in winter. The cold is therefore very great. Yakutsk has a mean January temperature of -46° , while the 'cold pole' of the world is situated at Verkhoyansk, where the January mean is -59° , the mean minimum -83° , and the lowest reading anywhere (-90°) has been recorded. As a result the anomalous condition arises of a *north* wind bringing warmer weather. Except for a narrow strip along the east coast and a wider area in the south-east the very cold conditions cover most of Eastern Siberia. The clear skies, the slight wind, and the dryness of the air make the temperature supportable by human beings, and, indeed, healthy.

In summer, as the isotherm map (Fig. 9B) suggests, there is a general decrease in temperature from south to north except close to the Pacific coast. The highest temperatures are experienced in the deserts of the south, where parts of Turan have a July mean exceeding 86° . While oceanic influences from the west are less powerful than in winter, areas of water have considerable ameliorating effect. The Arctic and Pacific coasts are cooler than the interior of Siberia; the Caspian Sea changes the directions of the isotherms in the neighbourhood; the maximum temperatures at latitude 55° on the Baltic are no higher than those at the deltas of North-east Siberia.

The distribution of temperature is far more even in July than January:



(A) JANUARY ISOTHERMS



(B) JULY ISOTHERMS

FIG. 9. MEAN TEMPERATURE DISTRIBUTION (IN DEGREES FAHRENHEIT)

PLACE	JANUARY		JULY		Range in ° F.
	Mean Temp. in ° F.	Abs. Min. in ° F.	Mean Temp. in ° F.	Abs. Max. in ° F.	
Batum . . .	43	18	74	95	31
Tashkent . . .	30	- 15	81	109	51
Leningrad . . .	15	- 35	64	97	49
Moscow . . .	12	- 44	66	99	54
Tomsk . . .	- 3	- 60	66	95	69
Yakutsk . . .	- 46	- 84	66	102	112
Verkhoyansk . . .	- 59	- 90	60	93	119
Range between ex- treme stations .	102	108	21	16	

All figures in this chapter are taken from Kendrew's *Climates of the Continents*, or from *Rastitelnost S.S.S.R.*, vol. i (Moscow, 1938).

An examination of the table shows that there is a rapid increase in the range of temperature from west to east and that the magnitude of this range is due mainly to the great cold of winter. It must be remembered, however, that it is hotter in July at Astrakhan than at Tangiers (same latitude), while Archangel has the same July average as York (60·5°). As with winter, the significant factor for man and plant is the length of the summer rather than its intensity. The northern lands have a very short summer, the south comparatively long; thus mean daily temperatures of over 64° occur on the average at Yalta for four months, Chkalov for two months, Moscow for three weeks. With ranges of temperature so great, changes from month to month must be rapid, especially in spring and autumn, which are generally short. At Moscow there is a change of 15° from March to April, at Astrakhan only a month elapses between the last frost and the attainment of a mean temperature of 48°. With the exception of Turan and the south-western steppes autumn is warmer than spring, and only the south has a prolonged autumn. A protracted spring benefits agriculture since soil and plants are then better able to absorb moisture for later use.

The Freezing of Rivers and Coasts

Over most of the U.S.S.R. even the largest rivers are frozen for considerable periods, which increase from South-west Russia to North-east Siberia. The Dniester is ice-bound for seventy days on the average, Central Russian rivers four to five and a half months, northern rivers five and a half to seven months. In Siberia most of the rivers are closed for six months, some for seven or eight months. Many rivers and lakes are frozen to the bottom. The freezing of the rivers has a great influence on the lives of the people, and a serious disadvantage is the closure of most of the Russian ports. The northern coast of Siberia is ice-bound most of the year, and ice almost reaches Novaya Zemlya. Through the influence of the Atlantic Drift the Murman coast in some years has no fixed ice, and during the coldest winters ports can be kept free by ice-breakers. The southern part of the White Sea is less open to the influence of the warmer water, and Archangel is closed for 190 days. The eastern half of the Gulf of Finland is closed completely for about three months, but Libau is sometimes free throughout the winter. Even the Black Sea shores are ice-bound for about seventy days between January and March, while the Sea of Azov is frozen across in mid-winter. The northern shores of the Caspian Sea are frozen every winter, ice remaining for some hundred days in the colder parts. Vladivostock is closed from mid-December until April, and the coast farther north for considerably longer.

Precipitation

The unbroken nature of the relief ensures that the precipitation over wide areas shall be very uniform, the nature and location of the oceans that it shall be generally light. Fig. 11 shows that most of European Russia and a wide belt in Western Siberia have at least 16 inches a year. Both to north-east and south of this central zone, the precipitation diminishes—to less than 8 inches near the 'cold pole' and along the Arctic coast, to less than 4 inches in the hot, southern deserts of Kizil Kum and Kara Kum. Oceanic influences

from the west penetrate the country by means of cyclones throughout the year, but particularly in summer. This causes a decrease in rainfall from north-west to south-east:

Riga	22 inches per annum
Moscow	21 inches per annum
Voronezh	18 inches per annum
Saratov	14.9 inches per annum
Astrakhan	6 inches per annum

Heavier totals occur in South-eastern Siberia and in Kamchatka, where the south-east monsoons bring up to 40 inches

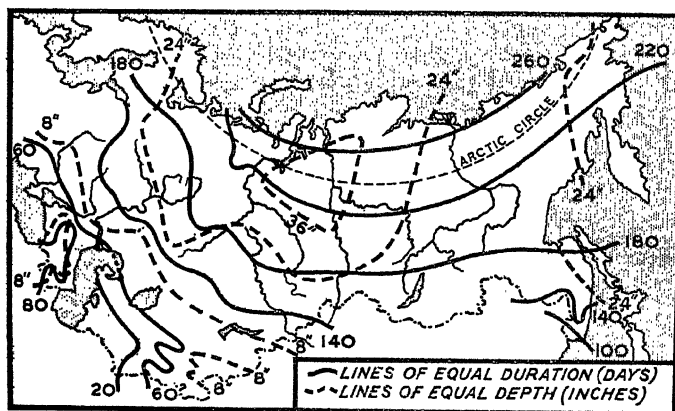


FIG. 10. DEPTH AND DURATION OF SNOW COVER

a year and the heaviest rain of the Union, exceeding 60 inches a year, falls on the eastern shores of the Black Sea.

The heating of the interior in summer causes a general inflow of air from coastal areas and maximum precipitation in that season. July and August are the wettest months over wide areas; only along parts of the Black Sea coast is there a winter maximum. Elsewhere, however, winter is not without precipitation, most of it in the form of snow. Eastern Siberia receives much less snow than areas west of the Yenesei, where it falls between November and April. Nowhere is the ground permanently covered; the greatest depth occurs in

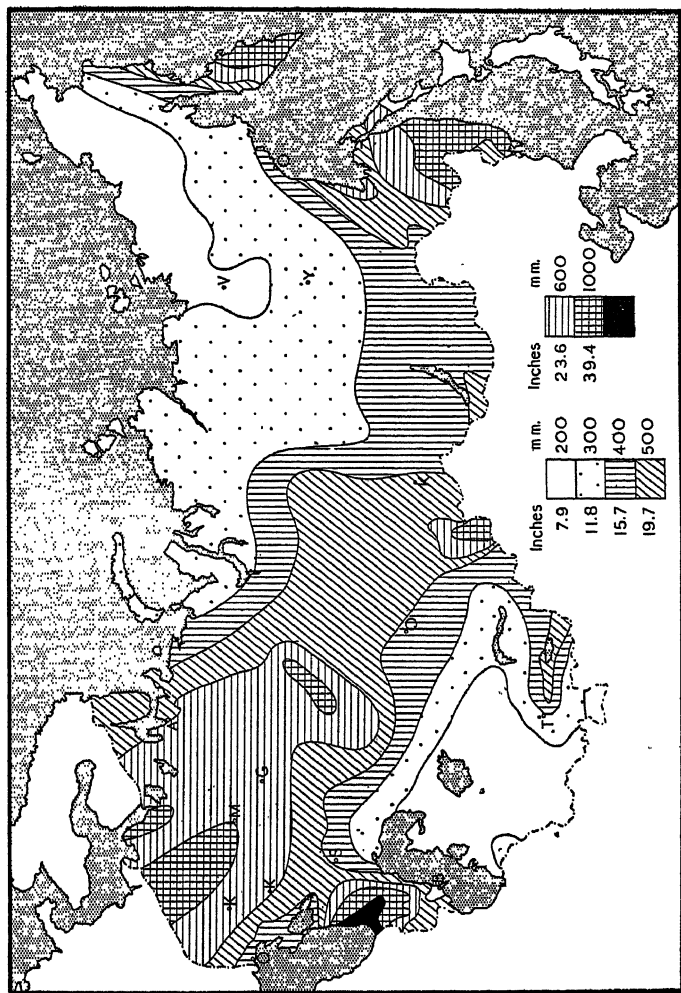


FIG. 11. MEAN ANNUAL PRECIPITATION

the Taiga, where it does not exceed 3 feet except in drifts (Figs. 10 and 12).

Both the rain of summer and the winter snow benefit man. The former comes in heavy showers accompanied by thunder, when it is most beneficial to crops. Moreover, the additional cloud mitigates the intense heat of the sun's rays. Snow, being a poor conductor of heat, prevents the ground from freezing, and the permanently frozen subsoil occurs only where the snowfall is light or absent—mainly in Eastern Siberia away from oceanic influence. Although the melting of the snow is accompanied by many disadvantages, it does provide a most valuable reserve of water for feeding rivers and nourishing vegetation. The floods which cover wide areas in spring are beneficial in that they raise the humidity of the air; the larger lakes relieve the long dry period in the same way.

Major Climatic Regions

Several classifications of the climate of the U.S.S.R. have been attempted. Apart from those of Russian writers—Voeikof, for example—the well-known divisions of Asia as a whole by Köppen and Thornthwaite¹ are important. Kendrew² has a useful, if simpler, scheme since the regions correspond with vegetational differences. The major climatic regions differentiated here (Fig. 13) are amplifications of Kendrew's and have been adopted since they correspond very closely with vegetation belts. Probably nowhere in the world do soil and vegetation depend so closely on the climate as in the U.S.S.R.

- (1) The Tundra Type.
- (2) The Taiga Type: (a) western; (b) eastern.
- (3) The Deciduous Forest Type.
- (4) The Amur-Ussuri Type.
- (5) The Siberian Pacific Coast Type.
- (6) The Steppe Type.

¹ Cited by L. Dudley Stamp, *Asia* (1935), p. 35.

² W. G. Kendrew, *Climates of the Continents* (1937), p. 187.

- (7) The Desert Type.
- (8) The Mediterranean Type.
- (9) The Transcaucasian (sub-tropical) Type.
- (10) The Mountain Types.

It should, however, be emphasized that the boundaries between these regions are zones, not lines; the transition from one type to another is generally very gradual. Moreover,

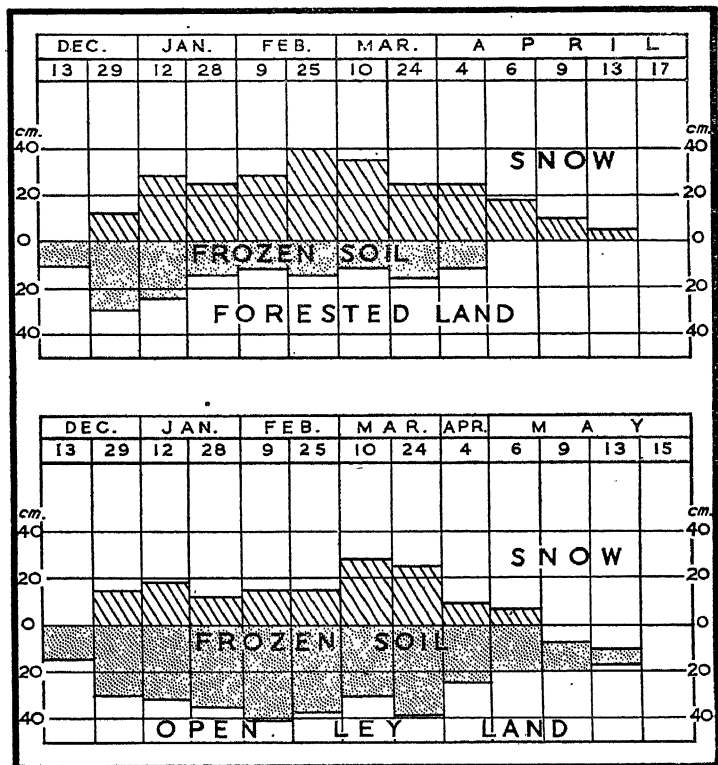


FIG. 12. DEPTH OF FROZEN SOIL AND SNOW COVER IN FOREST AND GRASSLAND

(Observations by N. A. Kachinsky at Moscow Regional Experimental Station.)

data are inadequate except for the broadest division, especially in the thinly peopled parts of Asiatic Russia.

THE TUNDRA TYPE

The southern boundary of this region is approximately the 50° isotherm for July. This line is significant because only farther south where the temperatures are higher and the summer longer will trees grow. The chief features of this climate are the long, cold winters, the short summers—only during two months does the temperature approach 50°—and the low precipitation. The winter is less cold than in Central Siberia. Sagastyr, at the mouth of the Lena, is about 25° warmer than Verkhoyansk in January. This may be due not so much to the moderating action of the Arctic Ocean, which is frozen for nine months, as to the prevalence of strong winds and the absence of temperature inversion. Nevertheless, the Tundra can be very cold, and temperatures below -40° have been recorded. The number of days experiencing temperatures below freezing-point increases from six months on the west to nine months towards the east. This illustrates again the importance of Atlantic influences, the warm drift of water keeping the Murman coast and the White Sea warmer than the interior of the Kola Peninsula; and Kendrew points out¹ that there the coldest area is the part sheltered by the Scandinavian mountains from westerly winds.

In general the ground is frozen hard most of the year, and the subsoil is frozen permanently. The summers are warm enough to thaw the surface for a month or two, but then the ground becomes waterlogged. The range of temperature is small; the Rybachi Peninsula, with a February mean of 21° and a July-August mean of 48°, has a much lower range than Astrakhan (58.9°). In the Far East—for example, at the mouth of the Kolyma—the Pacific causes higher winter and lower summer temperatures.

The precipitation is generally low, decreasing from about 16 inches in the Kola Peninsula to between 8 and 12 inches

¹ *Climates of the Continents*, p. 171.

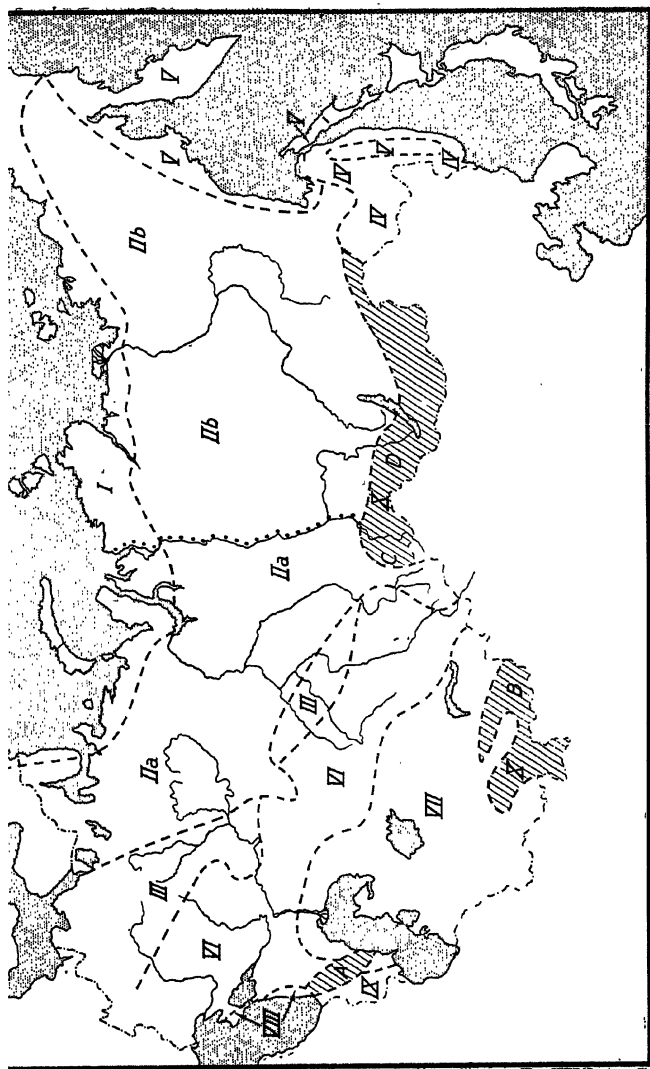


FIG. 13. MAJOR CLIMATIC REGIONS

I, the Tundra Type; II, the Taiga Type ((a) Western, (b) Eastern); III, the Deciduous Forest Type; IV, the Amur-Ussuri Type; V, the Siberian Pacific Coast Type; VI, the Steppe Type; VII, the Desert Type; VIII, the Mediterranean Type; IX, the Transcaucasian Type; X, the Mountain Types ((A) Caucasus Mountains, (B) Turkestan Mountains, (C) Altai Mountains, (D) Sayan Mountains).

for most of the remainder, though it is only 4 inches on the average at the Lena delta. This is a result of the low evaporation by winds crossing the Arctic Ocean, and while snow may fall during any month the quantity is small and the snow cover is slight. This is partly due to the prevalence of very strong winds, attaining occasionally speeds of 80 m.p.h., which blow from sea to land in summer and from land to sea in winter. The latter is often afflicted by the 'purga'—a wild storm with high wind and driving snow, so that the light is obscured by "a fog of snow." Throughout the year the sky is very cloudy—averaging 7·5 tenths; but east of the Lena anticyclonic conditions cause considerable clearing in winter.

THE TAIGA TYPE

The climatic region associated with the coniferous forest covers a huge area. It lies south of the Tundra, and extends from the western boundaries of the U.S.S.R. eastward to the high barriers of the Stanovoi and Cherski Ranges. Its southern boundary is ill-defined, but lies somewhere in the transition zone between taiga and deciduous forest in the west and in the wooded steppe of centre and east which marks the gradual change from forest to grassland. The area is so great that considerable subdivision is possible,¹ and, with the acquisition of more data, very desirable. With the regional treatment of vegetation in mind, here only two broad areas will be distinguished—those lying approximately west and east of the Yenesei.

First the general features may be outlined. The summers are warm, with July and August temperatures averaging between 50° and 68°; the winters are cold and long—January averages 20° in the west and — 50° in the Lena region. The precipitation varies between 12 and 24 inches a year with a maximum in summer, but with considerable quantities of snow, especially west of the Yenesei. There is a very close interaction between climate and vegetation; the

¹ Kendrew (*op. cit.*) designates five main sub-regions, each composed of two minor regions.

dense coniferous forest is limited by the adequacy of the precipitation, particularly the summer quota, and the relative humidity of the air must exceed 50 per cent. The trees provide shelter from the wind, so that the snow lies deep for

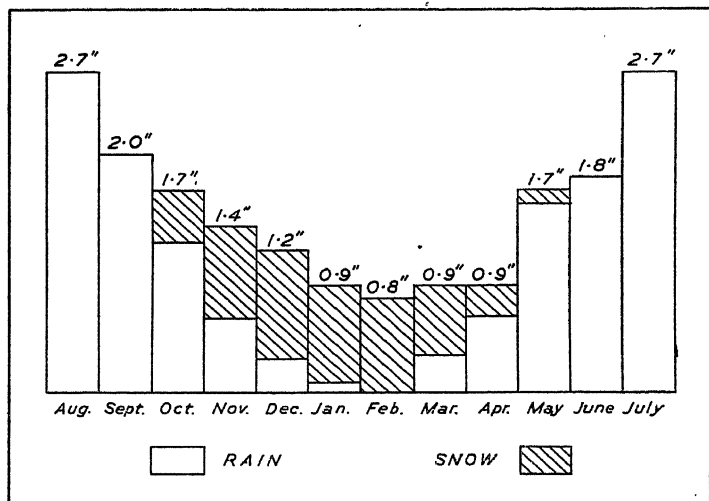


FIG. 14. PROPORTIONS OF RAIN AND SNOW IN THE AVERAGE PRECIPITATION AT LENINGRAD

long periods, at least a hundred days, preventing the freezing of the ground and providing abundant moisture in the spring.

The Western Taiga

Here the cyclonic influences from the west are strongly felt in both seasons. The total precipitation exceeds 24 inches, and at least 30 per cent. of this comes in winter as snow (Fig. 14). As the table shows (p. 82), there is a slight diminution in quantity towards the east, and the maxima shift from late summer and autumn near the Baltic to July and August in the interior.

PRECIPITATION (IN INCHES) IN THE WESTERN TAIGA

CENTRE	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Leningrad (30 feet)	0.9	0.8	0.9	0.9	1.7	1.8	2.7	2.7	2.0	1.7	1.4	1.2	18.8
Tobolsk (340 feet)	0.7	0.6	0.7	0.8	1.3	2.7	3.5	3.2	1.5	1.4	1.3	0.9	18.6
Tomsk (390 feet)	1.1	0.8	0.8	0.7	1.5	2.7	3.0	2.3	1.4	2.4	1.4	1.9	19.9

The curve of the isotherms (Fig. 9) indicates the importance of Atlantic warmth, especially in winter, and the extremely low readings of Eastern Siberia are not recorded, but the table below shows the effect of increased distance eastward on the winter temperatures.

MEAN TEMPERATURES (IN DEGREES FAHRENHEIT)
OF WESTERN TAIGA

CENTRE	Jan.	July	Average	Range
Leningrad (30 feet)	15.3	63.9	38.7	48.6
Tobolsk (340 feet)	- 2.2	66.4	31.6	68.6
Tomsk (390 feet)	- 3.3	65.7	30.2	69.0

But mean values do not give an accurate picture of the conditions. Sudden changes in temperature from day to day are frequent; east of the Urals readings of -40° F. are quite common, and on the Volga -20° F. has been recorded. There is less variation in summer, and the cloudiness of the sky, very marked in European Russia (Leningrad has only thirty-nine days a year on the average with clear skies), helps to moderate the sun's heat and retards evaporation.

In places and on occasion winds blow with considerable force. Along the lower Yenesei winds between east and north-west laden with fine, hard snow blow from six to twelve days. These 'purga' carry the hard, driven snow through crevices into every dwelling and prevent all movement out of doors. The passage of depressions from the Baltic eastward is often accompanied by strong winds from a westerly quarter. On these occasions, because the Neva only falls twenty feet in its passage from Lake Ladoga to the Gulf of Finland, the

wind is able to hold up the water and cause serious floods in Leningrad.

The rivers of the Western Taiga are frozen for long periods. The river Ob is free only 193 days at Kolyvan, 146 days at Obdorsk; the Yenessei is free 197 days at Yenesseisk and 186 days at Turukhansk. The rivers rarely thaw before April, and then huge floods result from the slow melting of masses of ice and snow, for the water is dammed back by the still solid ice of the cold lower reaches. The gentle gradients of the rivers also prevent rapid dispersal of the water, which extends over a breadth of 12 to 40 miles near the junction of the Irtysh and Ob and is frequently 30 miles wide at the mouth of the Yenessei.

The Ural Mountains form no climatic barrier, but their height is sufficient to cause local variations. The chief feature is the heavier precipitation on the western slopes. In the central portion, the west on the average has a fall 6 inches heavier than the east. The former may have more than 24 inches, and the quantity and duration of cover of snow is greater here than on the lowlands or the eastern slopes. To the north and south of the range precipitation diminishes and climate approximates more closely to tundra and steppe respectively.

Changes in altitude cause variation in temperature, not only normally but through frequent examples of temperature inversion, thus:

	<i>Jan. Mean</i>	<i>July Mean</i>
Ivanov Mine (2782 feet) .	3·5°	58·5°
Zlatoust (1080 feet) . .	3·5°	61·0°

The January means are the same despite a difference of 1700 feet.

The Eastern Taiga

East of the Yenessei the development of the unequalled high-pressure system between October and April results in clear skies and frequent calm conditions which intensify the

frigidity of winter. Nowhere does the January temperature exceed 15° . At Yakutsk — 58° is a common reading, while the 'cold pole' near Verkhoyansk has a January mean — 59° F. The lowest temperature ever observed, — 90° , was

MEAN TEMPERATURES (IN DEGREES FAHRENHEIT)
IN THE EASTERN TAIGA

CENTRE	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Av.	Range
Verkhoyansk (330 feet)	— 58.9	— 47.4	— 24.0	7.3	35.4	54.5	59.7	49.8	36.3	5.2	— 34.4	— 52.6	2.7	118.6
Yakutsk (330 feet)	— 45.9	— 35.1	— 10.1	15.8	40.6	59.0	66.2	59.5	42.4	16.2	— 20.9	— 40.5	12.2	112.1
Irkutsk (1610 feet)	— 5.4	0.9	16.5	34.9	48.0	59.2	65.1	60.4	48.2	33.3	12.9	0.7	31.9	70.5

NUMBER OF DAYS WITH TEMPERATURE BELOW FREEZING-POINT

Tomsk	187
Verkhoyansk	231
Russkoe Ustye	257

recorded here in February 1892 (table adjacent). As the January isotherms indicate away from the 'cold pole' the temperature rises in all directions and it may be cold in winter in Transbaikalia as on the Lower Ob. Of course, the Far North has no direct insolation at this season, and the winters are longer than in the South.

The possibility must be borne in mind that the very low temperatures recorded are not applicable to the whole of this huge region. Records are few, and have been taken mainly at settlements which often lie in hollows where temperature inversion occurs. A few readings made on the plain support this idea.

The intense frost produces striking phenomena. Long deep fissures open in the ground, which emits strange

rumbling noises. Trees are frozen hard and resemble iron. Yet human beings find the conditions quite supportable owing to the dryness of the air, the slight wind, and the clear skies. The pure air is healthy, and in Yakutia it is common for the natives to wear relatively light clothing when out of doors with the thermometer many degrees below zero.

PRECIPITATION (IN INCHES) IN THE EASTERN TAIGA

CENTRE	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Verkhoyansk (330 feet)	0.2	0.1	0	0.1	0.2	0.5	1.2	0.9	0.2	0.2	0.2	0.2	3.9
Yakutsk (330 feet)	0.9	0.2	0.4	0.6	1.1	2.1	1.7	2.6	1.2	1.4	0.6	0.9	13.7
Irkutsk (1610 feet)	0.6	0.5	0.4	0.6	1.2	2.3	2.9	2.4	1.6	0.7	0.6	0.8	14.5

In all the above examples the maximum fall occurs in July or August, and, indeed, a most important aspect of the regime is the high proportion which falls in summer. Comparison with the Western Taiga is instructive. (See table below.)

PROPORTION OF PRECIPITATION FALLING IN JUNE, JULY, AND AUGUST

EASTERN TAIGA		WESTERN TAIGA	
Verkhoyansk	67 per cent.	Beresov	43 per cent.
Yakutsk	47 per cent.	Toms	40 per cent.
Irkutsk	53 per cent.	Barnaul	42 per cent.

In consequence of this distribution the amount of snowfall in the Eastern Taiga is much less than in the west, and although the relationship between quantity and number of days on which snow falls is not perfect, the following table is striking.

AVERAGE NUMBER OF DAYS WITH SNOW

EASTERN TAIGA	WESTERN TAIGA
Irkutsk . . . 27 Nerchinsk . . . 29	Tobolsk . . . 47 Yenesseisk . . . 104 Tomsk . . . 121

The very light snow cover—it is only about 4 inches when deepest, in November at Yakutsk—has very far-reaching results. The prolonged low temperatures and the bare ground permit it to be frozen to very great depths. The short summer only thaws out the surface layers; in Yakutia the top 9 feet thaw in the south, only 2 feet in the north. The presence of the permanently frozen subsoil ('merzlota') prevents the infiltration of water from melting snow and causes swamps and intensifies the flooding of the land by rivers. The merzlota also controls the type of natural vegetation and the extent to which cultivation is possible. In Yakutia potatoes and the hardier cereals are grown during the short summer in the layer of thawed earth, but in the Olekhminsk district the summer rainfall is so scanty that irrigation is necessary for successful cultivation.

THE DECIDUOUS FOREST TYPE

This is a triangular region lying between Taiga and Steppe and reaching its greatest extent in European Russia. The apex of the triangle points eastward, and the forest zone with the exception of a short break at the Urals, extend eastward as a narrow belt to the Ob. The climatic region however, may be taken to comprise the broad area in European Russia.

The main features are fairly presented by the figures for Moscow and Kazan.

The winter cold throughout the region is intense, with temperatures below -40° at Moscow. The lower average readings at Kazan illustrate the more continental aspect of the climate towards the south. The truth is that, despite the high-pressure area which develops over the interior in winter, the warmer Atlantic influences are comparatively strong, especially in the north of the region. Winds from a westerly quarter are common, and a break in the anti-cyclonic conditions results in short 'warm spells' in December, when temperatures of 46° have been recorded. But winter is a trying time, with the cold more difficult to bear than in Siberia, because the air is damper.¹ Snow begins to fall in October and lies on the ground for an average of 140 days. November is the snowiest month, but the snow lies thick until March and the weather is generally dull, gloomy, and cloudy.

Cyclonic influences from the west affect most of the region in summer, so there is less contrast between the means for Moscow and Kazan. Generally the average temperature is high—between 68° and 77° —with maximum readings over 90° . Summer is the cloudiest season, but when the skies are clear the sun beats down with great intensity. As in many other parts of continental Russia, there is a big diurnal range, the night temperatures often dropping into the lower thirties.

¹ Relative humidity at Kazan in December is between 87 per cent. and 92 per cent.

MEAN TEMPERATURE AND PRECIPITATION AT MOSCOW AND KAZAN

COUNTRY	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	Average	Range
Moscow (480 feet)															
Temp. ($^{\circ}$ F.)	12.2	14.7	23.4	38.3	53.1	61.5	66.0	62.8	52.2	39.7	27.7	17.2		39.0	53.8
Rainfall (inches)	1.1	0.9	1.2	1.5	1.9	2.0	2.8	2.9	2.2	1.4	1.6	1.5	21.0		
Kazan (250 feet)															
Temp. ($^{\circ}$ F.)	7.2	9.7	19.6	37.8	53.8	62.8	67.3	63.3	51.4	38.7	25.2	11.1		37.4	60.3
Rainfall (inches)	0.5	0.4	0.6	0.9	1.6	2.2	2.4	2.4	1.6	1.1	1.0	0.7	15.4		

Throughout the region summer rain predominates, with July and August the wettest months. The proportions of rain falling in the months June, July, and August are 36 per cent. at Moscow, 39 per cent. at Ufa, and 40 per cent. at Vyatka. The heaviest rain falls in the west, Byelorussia, the Pripet and Beresina basins having 27-28 inches a year, and the amount decreases towards the east. The rain comes in heavy showers, on the average every other day, frequently accompanied by thunder.

The extreme conditions and the resulting rapid changes during the short spring and autumn ensure that the lives of the people are very intimately connected with the weather. In Moscow, for example, signs of approaching summer are awaited eagerly and looked for at certain dates in which there seem to be little variation. About March 18 the first thawed patches of snow appear, the next day the first of the migrating rooks fly in. The real thaw begins in April, and within a week most of the snow has gone. This is the unpleasant season of the 'rasputitsa,' when the rapid thaw causes deep mud, widespread floods, and raw air. By April 12 Moscow river is free of ice, a few days later the first spring flowers appear, and by April 19 no snow is left. The onset of winter is heralded similarly by definite events which occur almost to a timetable every year. The first snow showers come in the middle of October; Moscow river is frozen by November 8.

The snow of winter has great significance for the Russians of this region. It provides a valuable reserve of water needed by the forest and for cultivation, it protects the soil from frost, and it gives a useful means of transport. In the past all the great fairs were held in winter because movement was easier then than in summer, when the badly made roads were impassable through mud or chokingly unpleasant from dust. The chief disadvantages from the snow cover were most patent outside the towns. The floods and mud of 'rasputitsa' tended to immobilize workers just when they wished to attain full activity in the spring. The long winter with the deep snow kept the peasants for long periods in huts which were often ill-ventilated. The increase of respiratory complaints at this season has been very marked.

THE AMUR-USSURI TYPE

This region comprises the lowlands of the Amur and Ussuri basins and the narrow coastal plain bordering the Japan Sea. The high coastal range—the Sikhote-Alin—has a modified climate more akin to that of the coastlands farther north, and it acts as an important climatic divide between the maritime region and the Ussuri-Lower Amur Lowland.

The climate is of the monsoon type. During the summer damp south-easterly winds blow inland and cause most of the precipitation to fall in that season. On the average 85 to 90 per cent. of the precipitation comes in the seven months April to November. At Blagoveschensk, on the upper Amur, a quarter of the total falls in July; at Khabarovsk, farther down the river, between July and September rain falls on the average on half the days of each month. Yet the total fall is not great (see table adjacent), being less at Vladivostock than at Moscow or Leningrad. Thus the winter precipitation is slight, and there is little snow cover.

While these conditions are fairly uniform from coast to interior, the same is not true of temperature. The Zeya and Bureya lowlands with the upper Amur are more continental than the Ussuri. The mean January temperature at Poyarkov on the Amur is -15.5° (20° lower than at Vladivostock); frosts are experienced until June and recommence in September. Blagoveschensk has on the average 172 days below freezing-point. In general winter is an unpleasant season, mainly on account of the strong north winds which sweep

MEAN PRECIPITATION AND TEMPERATURE FOR BLAGOVESHCHENSK AND VLADIVOSTOCK

CENTRE	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	An.	Range
Blagoveshensk:															
Rainfall (inches)	0.1	0.1	0.3	0.9	1.6	3.4	4.7	4.8	2.8	0.7	0.3	0.1	19.8		
Vladivostok															
Temp. (° F.)															
Rainfall (inches)	4.8	12.4	26.4	39.2	48.7	56.8	66.0	60.4	51.3	48.6	29.8	13.6	39.7	64.6	
	0.1	0.2	0.3	1.2	1.3	1.5	2.2	3.5	2.4	1.6	0.5	0.2	14.7		

down the Amur valley.¹ The sky is much less cloudy in winter than in summer, and the light snow cover permits freezing of the soil to a considerable depth, though not permanently. Because of this spring is a very short season, and

autumn, with the absence of wind and cloud, the cessation of rain, and the warm sunshine, is the most pleasant time of the year.

The cold and the thin snow cover cause the rivers to be frozen as long as those of Northern Siberia. The Amur is closed for 197 days at Blagoveschensk and 177 at its mouth. In summer the rivers cannot cope with the excessive amount of water from the torrential rains. The Amur floods the surrounding land to a width of 15 miles in places, and much of the lowland becomes water-logged for a time. The heavy summer rain makes the cultivation of European cereals impossible in many areas.

THE SIBERIAN PACIFIC COAST TYPE

In the absence of any detailed climatic knowledge of this region its boundaries approximately may be taken as extending from the Pacific coast westward to the barrier of the Stanovoi Mountains and from the Tundra southward almost to the mouth of the Amur. This includes the peninsula of Kamchatkha.

The general and most pronounced feature of the climate is its maritime aspect. Damp, cool winds blow inland from the sea in summer, bringing drizzling rain and much fog. As

the figures for Okhotsk indicate, the total precipitation is small, with 73 per cent. falling in the months June to September. An important feature is that the maximum comes later here (September) than farther south, while a secondary maximum occurs in June.

¹ Nikolaievsk is 5° colder than Ayan, 350 miles farther north, on this account.

MEAN PRECIPITATION AND TEMPERATURE FOR OKHOTSK

CENTRE	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	Ao.	Range
Okhotsk (30 feet):															
Temp. (°F.)	— 10.5	— 7.2	6.6	21.4	35.1	45.3	54.9	55.2	46.4	26.6	5.5	— 7.8		22.6	65.7
Rainfall (in.)	0.1	0.1	0.1	0.2	0.5	1.1	0.5	1.8	2.1	0.7	0.2	0.2	7.5		

The distribution of precipitation through the year suggests that only a small quantity of snow will fall, but d'Almeida says that the coast of the Sea of Okhotsk is one of the snowiest in the world. At times a powerful wind blows from the south-east often accompanied by snow, and is a serious menace to shipping.

The winters are very cold, though less extreme than in the interior, and the January mean at Okhotsk is 25° lower than that at Leningrad, which is approximately the same latitude. Strong, dry, cold winds, mainly from the north-west, are common at this season. The shallow waters of the Sea of Okhotsk become frozen, and the slow thawing of the ice retards the advent of spring. The summers are short and cool. In the main the Sikhote Alin has a similar regime, with modifications due to variation in altitude.

Kamchatkha

The peninsula extends between 60° N. and 51° , and consequently there are considerable climatic differences between north and south. In general Kamchatkha has stormy and changeable weather, 'oceanic' in character, with the interior more extreme than the coast and the west more extreme than the east. The average temperature for the year is low, owing to the influence of the cold Kurile current which washes both coasts. At Petropavlovsk, on the eastern side, the August mean is 53.5° and the February 12° .¹ The east is also wetter than the west because of the former's oceanic outlook, *e.g.*, Petropavlovsk 35 inches, Bolsheretsk (west coast) 18 inches. Moreover, up to 50 per cent. of the precipitation of the former may be in the form of snow, and depths of 7 feet are usual. Less than 17 per cent. is in this form on the west.

Sakhalin

The Russian portion of Sakhalin has a latitudinal extent corresponding to that of England, yet its average temperature is much lower and its short summer has a temperature no

¹ 199 days on average below freezing-point.

higher than that of Archangel. In summer winds are persistent from south and east, in winter they blow from the cold interior of Siberia, and all have to cross the cold water which flows along both coasts. The skies are always very cloudy, and fogs are common. More than eight days of sunshine between June and September is considered unusual. The total precipitation is between 12 and 20 inches, much of it as snow, which remains on the mountains until the middle of August.

THE STEPPE TYPE

The steppe type of climate is found along a broad belt south of the deciduous forest type. It touches the shores of the Black Sea in the west, includes the northern half of the Crimean Peninsula, and meets the desert in the east. This type differs from most of the foregoing regions in that the oceanic influences from the west are much less significant even in European Russia. The area is vast, and there must be considerable variation over it, but certain general features may be noted. The prevailing winds are from the north-east and dry, producing slight precipitation of between 8 and 16 inches, most of it in spring or early summer. It falls in heavy showers, accompanied by violent thunderstorms, the result of rapid heating of air near the earth's surface producing instability, since the upper air is still cold. In the black earth lands and the pre-Urals twenty storms a season is an average number. The summers are hot, the average July temperature exceeding 66°, the relative humidity is low in summer and cloud not great except in December. The snow cover is slight, especially in the south, so the ground is exposed to the full effects of frost for a long period; for five months of the year the average temperatures are below freezing-point. In general spring is short, dry, and begins vaguely, a warm day being followed by several cold ones. This is the season of the 'rasputitsa' and its attendant discomforts, all the more exaggerated in the steppes because of the rapidity with which the ice melts and the friable nature of the soil. The general conditions are illustrated in the table at p. 93.

The steppes get progressively drier towards south and east—thus Kiev has a total of 21 inches, Odessa 16 inches, Omsk 12 inches, while the proportion falling in the three summer months June to August diminishes southward—Kiev 37 per cent., Odessa 29 per cent. The mean July temperatures remain fairly even throughout the region, but the January figures become progressively lower towards the east. Thus in the adjacent table Saratov has a mean of 11.5° , Orenburg 3.4° . In the south the Black Sea prevents such great extremes of temperature (Odessa means—January 25.3° , July 70.9°), but for three months the averages are below freezing-point and Odessa bay freezes in hard winters. The snow cover is very light here—less than 4 inches at the port—and lasts on the seashore only between twenty and sixty days. In the black earth lands the snow lasts between sixty and a hundred days.

Day	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	Ave.	Range
Kiev	66	72.1	68.9	57.4	43.3	28.9	17.6	14.9	42.1	60.6
Odessa	71	72.1	67.3	55.4	43.3	24.1	10.6	15.2	37.9	67.5
Omsk	64	70.9	67.3	55.4	39.2	24.1	10.6	15.2	37.9	67.5
Saratov	67	72.1	68.9	57.4	43.3	28.9	17.6	14.9	42.1	60.6
Ufa	64	70.9	67.3	55.4	39.2	24.1	10.6	15.2	37.9	67.5
Yekaterinburg	64	70.9	67.3	55.4	39.2	24.1	10.6	15.2	37.9	67.5

The weather in many parts of the steppe is liable to sudden changes. The development of local low-pressure systems in the Black Sea area in summer causes violent winds to sweep across the flat plains. These are often of short duration, but they can do much damage to crops. In winter the Novorossisk district is often afflicted by a cold, dry north-east wind of great force, while in parts of the steppes, especially round Orenburg, the violent storms, laden with snow, can endanger the lives of men and animals. In the south of the steppes the rainstorms of early summer, though less frequent than elsewhere, are more violent, and remarkable quantities of rain fall in a short time, sometimes damaging crops. In one recorded instance nearly 1 inch of rain fell in eight minutes.

MEAN TEMPERATURE AND PRECIPITATION FOR
SARATOV AND ORENBURG

CENTRE	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	Ave.	Range
Saratov (295 feet):															
Temp. (° F.).	11·5	14·9	23·9	41·0	58·6	67·1	72·1	68·9	57·4	43·3	28·9	17·6		42·1	60·6
Rainfall (inches)	0·9	0·8	0·7	1·1	1·1	1·5	1·7	1·3	1·2	1·5	1·4	1·6	14·9		
Orenburg (560 feet)															
Temp. (° F.).	3·4	6·1	16·5	37·9	57·7	65·8	70·9	67·3	55·4	39·2	24·1	10·6		37·9	67·5
Rainfall (inches)	1·1	0·8	1·0	0·9	1·4	2·0	1·7	1·3	1·3	1·2	1·2	1·2	15·2		

in another 2.2 inches in ten minutes. These cause much gullying in the soft soil. Crops are also damaged occasionally by dust storms; in one case a layer one and a half inches thick was spread over the fields. The high winds responsible, of the whirlwind type, can transport the fine material great distances. Dust from the steppe has been dropped in Leningrad at the rate of one or two grams to the square metre, and there is some possibility that germs of epidemics may be carried at the same time.

THE DESERT TYPE

This large region may be taken approximately as the area which has less than 8 inches of rain a year and includes the land often designated "semi-desert." From the Caucasus the region surrounds the Caspian and extends eastward to the foothills of the mountains along the Soviet frontier. A small outlier is present in the Baku district.

The chief characteristics of the climate are the paucity of precipitation, with dry summers and spring maximum, and the considerable range of temperature. These features are brought out for widely distributed stations in the following table.

THE DESERT TYPE

CENTRE	MEAN TEMP. IN ° F.		DURA- TION OF FROST IN DAYS	PRECIP- ITATION IN INCHES	PERCENTAGE OF PRECIPITATION			
	Jan.	July			Spring	Summer	Autumn	Winter
Kazalinsk (205 feet).	15.5	79.0	173	4.9	29	18	26.5	26.5
Tashkent (1610 feet)	30.0	80.8	204	14.0	43	5	18	33
Margelan (1948 feet)	*	*	224	6.5	40	11	18	31
Turtkul (295 feet)	22.6	83.1	*	2.4	54	4	13	29
Merv (755 feet)	34.5	86.0	109	7.5	45	0	7	48
Baku	38.1	78.8	*	9.5	23	7	35	35

* No record.

Thus the summers are almost rainless and very hot, the cloudless sky giving free play to a pitiless sun, and shade temperatures may reach 122° in Southern Turkestan. The soil is hotter than the air, and readings of 174° have been obtained. As is usual in desert regions, the clear skies permit

rapid radiation at night and a sharp drop in temperature which may amount to 108° . The hottest conditions are experienced in the Aral-Caspian region, where sandstorms assume serious proportions. The winters are generally cold and in some areas prolonged. Temperatures diminish rapidly from south to north; the stations near the mountains have milder conditions than those to the north, Kazalinsk is as cold in January as Northern Norway. Here snow will remain on the ground for seventy days,¹ and the Syr Darya is frozen for four months on the average. The Caspian introduces ameliorating influences to adjacent lands in east and west, and snow is very rare at Baku, but the northern shores are cold—mean January temperatures at Astrakhan 19.0° , at Gusev 13° F.

Conditions are unfavourable to the formation of cloud in summer, and the sky is only half covered on the average in January. Only very occasionally do cyclones penetrate from the west, but winter precipitation generally comes with westerly winds. Occasionally hot dry winds from south and south-west scorch up vegetation. The spring maximum in the rainfall is probably due to local conditions similar in origin to the convectional overturning in the atmosphere which cause the storms on the steppes. The low summer rain and, even more important, the duration of the drought² make cultivation impossible without irrigation, and the mountains of the border are of great value for providing the water.

THE MEDITERRANEAN TYPE

According to Russian geographers the typical Mediterranean climate is found only in one small area—the south shore of the Crimean Peninsula between Foros and Alushta, but we may add another small region—the north-east coast of the Black Sea between Novorossisk and Sukhum, since the conditions are only slightly different. The figures for Yalta are typical.

¹ Skating and sledging may be in full swing at Kazalinsk while peaches are ripening at Tashkent.

² At Repetch in 1913, 131 days elapsed without a drop of rain.

The winters are mild; on the average frost occurs only on fourteen days in January and eight days in February. The summer mean is high, but is lower than in the desert. The rainfall is light, with a maximum (59 per cent.) in the months

MEAN TEMPERATURE AND PRECIPITATION FOR YALTA

CENTRE	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	Average	Range
Yalta (135 feet): Temp. (° F.) Rainfall (inches)	38.3 1.6 1.6	38.3 1.6 1.6	43.7 1.6 1.6	51.3 1.3 1.3	61.3 1.1 1.1	69.3 1.3 1.3	75.6 1.3 1.3	75.6 1.3 1.3	67.1 1.4 1.4	58.3 1.7 1.7	50.0 2.0 2.0	44.1 3.0 3.0	56.1 19.9	56.1	37.3

October to March; thus the remaining six months have a larger proportion than many places on the Mediterranean coast. Both areas have very mild winters because they are protected from the cold northerly winds by ranges of mountains. This is more pronounced in the Crimea, where Foros has a very mild winter and a January mean the same as that of Bordeaux (40.5°). This feature, with the hot summer sunshine from blue skies, the maritime outlook, and the luxuriant vegetation, combine to provide the ideal holiday region for people from the interior.

THE TRANSCAUCASIAN (SUB-TROPICAL) TYPE

The chief area of this type is the Kolkhiz Lowland, which lies south of the main Caucasus chain and opens westward to the Black Sea

MEAN TEMPERATURE AND PRECIPITATION FOR BATUM

CENTRE	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	Average	Range
Batum (20 feet): Temp. (° F.) Rainfall (inches)	43.0 10.2 10.2	43.9 6.0 6.0	46.6 6.2 6.2	52.2 5.0 5.0	60.3 2.8 2.8	68.4 5.9 5.9	73.4 6.0 6.0	73.8 8.2 8.2	67.8 11.9 11.9	61.9 8.8 8.8	53.2 12.2 12.2	48.2 10.0 10.0	57.7 93.3	57.7	30.6

between Batum and Sukhum. The figures for Batum illustrate the climatic conditions.

The winters are very mild, milder than in Yalta, and the summers cooler; hence the range is small. In striking contrast to most of the foregoing Russian types is the slight change in temperature between the months during midsummer and

mid-winter: July–August 73.4° – 73.8° , January–February 43.0 – 43.9° , a characteristic which it shares with the Mediterranean type above.

The precipitation—as rain—is very heavy, falling throughout the year, but with a slight maximum (57 per cent.) in winter. The total is exceptionally heavy at Batum (93.3 inches), partly through its location with respect to local relief features, but the regime is similar at Kutaisi, with 50 inches (52 per cent. in winter), and Ozurgeti, 82 inches (57 per cent. in winter).

Wind directions and the temperature of the Black Sea play important parts in the formation of this climate. Damp, cool winds from the sea are frequent in summer, warm winds from easterly quarters in winter. In addition typical ‘föhn’ winds develop in the high valleys and sweep coastward, especially in winter, causing pronounced rises in the temperature. Readings of 86° have been secured in March when such a wind was blowing. In autumn the Black Sea in this quarter is comparatively warm—e.g., October 64° , November 55° .

A modified outlier of this type occurs on the Caspian shore of Transcaucasia, in the basin of the river Kura. It is a small area behind Lenkoran, south of the Baku dry zone. The rainfall is fairly heavy, exceeding 48 inches with a maximum in autumn; the winters are mild, but cooler than the Black Sea counterpart, and the summers hot (Lenkoran January mean 37° , July mean 79°). The winds have the same monsoonal tendency, from the Caspian in summer, westerly in winter, and the ‘föhn’ winds are common chiefly in the winter.

MOUNTAIN CLIMATES

Under this heading only general statements are possible, and in no sense is a normal regional treatment attempted. The effect of altitude causes great variations, and the scarcity of meteorological records prevents accurate statements except in a few localities.

The Crimea

The Yaila Mountains rise sharply from the coast to a height of 5000 feet; conditions vary from the Mediterranean type at the foot through a forested belt to a more continental type near the top. The rainfall is heavy, exceeding 40 inches, with a minimum in spring.

The Caucasus Mountains

This great barrier, with considerable areas over 6000 feet, has its climate strongly controlled by altitude, and there is considerable difference between eastern and western parts. In general, precipitation increases and temperature decreases normally with increase in height, but the drainage of cold air into sheltered valleys often produces anomalous conditions.

MEAN TEMPERATURE AND PRECIPITATION FOR THE CAUCASUS

CENTRE	MEAN TEMPERATURES IN ° F.		MEAN PRECIPITATION IN INCHES
	<i>Jan.</i>	<i>Aug.</i>	
Kobi (6458 feet) . . .	17.5	57.0	47.0
Goodaur (7163 feet) . .	20.0	56.5	58.0
Krestovi Pass (7735 feet)	11.0	53.0	66.7

The western half of the ranges has a mean annual precipitation exceeding 40 inches at moderate heights with the maximum in late spring or early summer, and with considerable snowfall. The eastern half is drier, less than 20 inches, and there is less snow. The extensive foothills of the northern side have conditions which reflect the influences of position and exposure.

TEMPERATURE AND PRECIPITATION FOR MAIKOP AND KISLOVODSK

CENTRE	MEAN TEMPERATURES IN ° F.		MEAN ANNUAL PRECIPITATION IN INCHES
	<i>Jan.</i>	<i>Aug.</i>	
Maikop (747 feet) . . .	28.0	72.0	26.0
Kislovodsk (2878 feet) .	24.0	66.5	22.5

Georgia and Armenia (the Little Caucasus)

South of the main ranges lies an upland region between 1200 and 2500 feet where wooded steppe is the chief form of vegetation. The climate is a transition type between Mediterranean and steppe. The annual precipitation is between 20 and 32 inches a year, with most in May and least during the winter. Shielded as the area is from the north by the Caucasus, and being of only moderate elevation, the region enjoys temperate winters and hot summers.

Snow is common in winter, but it does not lie on the ground for long below 8000 feet. 'Föhn' winds help to temper the winter cold, especially round Tbilisi. The mild winters, the hot, moist summers, and the abundance of sunshine (the average cloud-cover for the year is between 40 per cent. and 85 per cent.) make this region well suited for the cultivation of a great variety of sub-tropical crops. The chief disadvantage is the frequent appearance in summer of violent storms accompanied by hail.

The Armenian Plateau. The plateau has an altitude ranging from 5000 to 8000 feet, and being far from the sea the climatic conditions tend to be cool and continental. A high-pressure system develops over the area in winter, when temperatures vary between 5° and 17·5°. The summers are cool (mean August temperature at Kass, just across the border, is 63·3°) and frosts are fairly frequent. The diurnal range of temperature is large. The northern portion, with an average of 30 inches, has a heavier precipitation than the south, which may have only 12 inches. Kass has 16·3 inches. Most of the rain comes in spring or summer, but there is much snow in winter.

MEAN TEMPERATURE AND PRECIPITATION FOR TBILISI

CENTRE	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	Av.	Range
Tbilisi (1350 feet):															
Temp. (° F.)	32·4	35·8	44·2	53·6	63·9	70·3	76·1	75·7	67·1	57·4	45·9	36·9		54·9	43·7
Rainfall (inches)	0·6	0·8	1·1	2·1	2·9	2·7	2·1	1·6	2·0	1·3	1·1	0·8	19·1		

The Erivan Plain lies at a lower level—3000 feet approximately—and has a southerly aspect, which combine to give more temperate conditions. The summers are hot (average 77°), the winters cool (average 20.5°), and the precipitation only 12 inches a year.

The Mountains of Central Asia

The Tian Shan and the Alai Ranges have been described as “un îlot humide en pays sec,” because although definite information is limited to a few sheltered stations the prevalence of dense forest on certain slopes testifies to a heavy precipitation. The forest growth is most prolific between 10,000 and 17,000 feet, and on slopes facing west and north. Below this, foggy, damp conditions are prevalent in winter, but the summers are drier and the desert conditions of the plain extend far up the mountain slopes. Snow is confined to the highest parts: the snowline rises from 11,000 feet in the west of the Alai to 18,000 feet in the east. The small amount of snow explains the fewness of glaciers,¹ and its high level permitted the construction of a military road from the Fergana valley to the Pamirs. Lower valleys experience ‘föhn’ winds which modify the temperature in winter. Readings of 70° have been secured in Tashkent when the wind was blowing.

Farther south, in the Pamirs, the air is dry and rare with persistent icy winds. At Irkeshtam, on the northern fringe, the precipitation is only 6 inches a year, at Pamir Post (12,000 feet) it is 16.5 inches and snow is rare. There is no permanent snow below 16,500 feet, and along the shores of some high lakes the ‘merzlota’ exists.

The Altai. The Altai Mountains rise to 15,000 feet and in general experience dry south and south-west winds in winter and damp north-west and west winds in summer. The heaviest precipitation occurs in the middle ranges, where it

¹ Voelikof suggests that the glaciers are fed not only from snow but from condensation of the moisture in the relatively humid westerly winds on the cool surface of the glacier.

exceeds 40 inches a year, and the amount diminishes rapidly towards the south, and is low in the foothills to the west. The average temperature is low, and some of the high mountain-rimmed plateaus have winter readings of -22° . The snow cover is light, with the soil permanently frozen below the depth of a metre. Temperature inversion in some valleys may amount to as much as 18° for a difference of 1700 feet.

The Sayan Mountains. Farther eastward the Sayan Mountains have a still less attractive climate. Heavy precipitation with much snow occurs in the north. A fall of 8 feet was recorded at one place in the winter of 1921-22, but the amount depends a great deal on aspect and situation. To the south and south-east the precipitation diminishes and tends to come more in summer. This feature and the clearness of the skies are reminiscent of the Mongolian steppe lands.

The Baikal Region. North to south across the high plateau region the climate changes from Taiga conditions to those of the Mongolian steppe. In general the precipitation averages twelve inches a year with some increase to the south-west, and a decrease to the south where it falls mainly in summer. The temperatures are extreme, ranges of 85° being common in Transbaikalia. There seems to be strong evidence that Lake Baikal is of sufficient size to cause modification in the extremes of temperature. This influence extends at least a hundred miles to east and west of the lake in July and considerably farther in early winter. The effect is most marked in December, because the latent heat from the ice forming during that month combines with the normal influence of a large body of water. There is much fog along the shores at this time. In January the temperature drops sharply, for the ice has formed—sometimes to a thickness of 9 feet—and the water remains frozen for four and a half months.

CHAPTER III

The Soils of the U.S.S.R.

SOILS are not rocks but independent bodies, consisting largely of mineral substances derived from the parent rock and partly of organic matter derived from plants. Dokuchayev, who may be described as the father of Russian soil science, defined soil thus: "The word 'soil' ought to imply only such outer horizons of rocks, and those adjoining them, as were more or less naturally modified by the mutual action of water and various kinds of organisms, dead or alive."¹

It is clear that in the process of weathering (the fragmentation and disintegration of the parent rock, and the accumulation of the products of weathering), and in the production and decomposition of vegetation which covers the soil, climatic factors play an important rôle.

From the time when Dokuchayev made his first studies to the present day, research and exploration have been carried out by Russian soil scientists throughout the vast territory of the U.S.S.R. Since the last century they have developed the climatic theory of soils, basing the processes of soil formation upon two main factors—temperature and moisture. The temperature of both soil and air is significant, since it controls rate of evaporation and hence movement of soil water. "Water in the soil is as blood in the veins," wrote Vysotsky (*Pedology*, 1906, Nos. 1-4). This is hardly an exaggeration, since it exerts influence mechanically, and chemically by acting as a solvent. The entire soil-forming process is intimately bound up with the work of water.

It has been clearly demonstrated that in the Soviet Union the major soil zones are arranged in roughly parallel belts extending from east to west, and changing in character from north to south and south-east as the precipitation decreases

¹ V. Dokuchayev, *Contributions to the Valuation of Land in the Government of Nizhni Novgorod* (1886, No. 1).

and mean annual temperature increases, the character of the major soil type in each belt being largely independent of the character of the underlying rock formation, and often extending across several such formations. Generally, the drier the climate, the less pronounced is the soil-forming process, and the greater the effect of relief and geology. In other words, when the parent rock exerts a strong influence the soil *as such* is not fully developed. Its full development may take many thousands of years.

Particularly important for the growth of plants is the presence in the soil of a sufficient amount of humus, the product of partially decomposed vegetation. Plants grow best in a soil composed of a complex of mineral matter and humus. The humus, in addition to containing important plant food, retains moisture and assists the integration of the soil into granules. The colour of the upper layers of the soil depends chiefly upon the presence of humus, varying from black where there is a large proportion, to grey where the proportion is small.

The final decomposition of the organic matter by means of the activity of micro-organisms leads to its mineralization—*i.e.*, to the formation of ordinary salts.¹ According to the amount of moisture in the soil more or less of the constituent parts of the humus is carried in solution to the lower layers, where they may mix with or act chemically upon the mineral matter derived from the parent rock. There are three layers, or horizons, in a complete soil profile: the *A* horizon, the most intensely weathered, from which salts and other soluble substances are constantly being removed by percolating water; the *B* horizon, usually more compact than the *A* horizon, and containing much of the material leached out of the latter; the *C* horizon, composed largely of fragments of the parent rock below. Apart from the effects of weathering, changes effected by water and the work of plants and animals are constantly occurring in the soil.

The amount of humus in the *A* horizon depends partly upon

¹ K. D. Glinka, *Dokuchayev's Ideas in the Development of Pedology and Cognate Sciences* (Academy of Sciences of the U.S.S.R., Leningrad, 1927).

the density of the vegetation cover (and thus indirectly upon climate), and partly upon conditions of moisture and temperature which enable organic matter to be broken down into the form of humus. Micro-organisms play an important part in this process. Under conditions of considerable or excessive moisture the humus may be washed out, or leached, depriving the upper soil of valuable plant food and transferring the leached material to the *B* horizon, leaving a poor surface soil.

Under arid conditions and a warm climate the absence of a well-developed vegetation cover limits the amount of humus in the *A* horizon. With sufficient aridity, the decay of organic matter is hindered, while evaporation causes ascending currents of water in the soil, resulting in the formation of carbonates in a layer either close to the surface or at a not very great depth below it. This is an important factor in the agriculture of dry regions.

But, in spite of what appears to be a strong climatic and vegetational control of the soil-forming processes, the major soil zones do not exactly coincide with either the major climatic or natural vegetation zones. For example, in some cases the effect of the parent rock may be so strong as to create an 'intra-zonal' type. In other cases relief may delay the complete maturing of the soil type, level land being most favourable for its full development. Long-continued cultivation and the destruction of the original vegetation also have considerable effect upon the soil.

It has not yet been possible to formulate a generally acceptable classification of soils which would take into account all the forces which are known to operate in their formation. The following scheme of major soil zones is based upon the influence of climate and natural vegetation on large tracts of land throughout a long period of time. J. N. Afanasyev writes, "The conception of soil as an independent natural body . . . was suggested to Dokuchayev by the Russian country. It was a new idea born in the Russian plain."¹

¹ J. N. Afanasyev, *The Classification Problem in Russian Soil Science* (Academy of Sciences of the U.S.S.R., Leningrad, 1927).

THE FUNDAMENTAL TYPES OF SOIL FORMATION ¹

I. LATERITE TYPE	II. PODSOL TYPE		III. STEPPE TYPE	IV. ALKALINE TYPE	V. BOG TYPE	
	<i>Primary Podsolized Soils</i>	<i>Secondary Podsolized Soils</i>			<i>Bog Soils</i>	<i>Salines</i>
1. Laterite	1. Forest podsolized soils	1. Secondary podsols	1. Chernozem	1. Alkaline soils		1. Carbonate-containing soils
2. Red soils	2. Meadow podsolized soils	2. Loams of schistose-nutty structure	2. Chestnut soils	2. Alkaline and slightly alkaline soils		2. Sulphate-containing soils
3. Yellow soils	3. Peaty podsolized soils	3. Degraded light and dark loams	3. Brown soils			3. Haloid saline soils
		4. Degraded chernozem	4. Grey soils (Sterozem type)			4. Mixed saline soils
		5. Brown soils (Ramann)	5. Red soils of sub-tropical desert steppe			Saline soils
Concurrent sandy varieties of various degrees of degradation						

¹ According to the classification of K. D. Glinka (1919-27).

This is the background of the Russian conception of major soil zones. It is understood, however, that within such a zone there may be considerable soil provinces possessing their own special characteristics developed under a variety of conditions.

In particular it must be remembered that soil formation is in a constant process of evolution, so that any static conception of soil-climatic zones cannot give a completely truthful picture of the facts. Soils are not simply the product of existing climatic conditions, but represent the total effect of changes which have taken place throughout the entire 'history' of the soil.

The Soviet soil scientist has changed his opinion in soil geography. He no longer considers it as a sketch of the location of immovable soil varieties, but as a designation and distribution of continuously evolving processes ruled by certain laws. In this way he has established a close connexion between soil geography and soil history.¹

AREA (IN PERCENTAGE OF TOTAL AREA) COVERED BY
DIFFERENT TYPES OF SOIL IN THE U.S.S.R.

REGION	EUROPEAN PART (excluding the Caucasus)	ASIATIC PART	U.S.S.R.
Tundra	53	69	14.7
Forest Tundra			52.5
Forest podsolized and bog soils			
Wooded Steppe	32	7	11.8
Chernozem steppe (Black Earth)			
Chestnut and brown soils	15	19	8.8
Desert sands			3.3
Serozem (grey soils)			5.7
Upland regions		5	3.2
Total area	1,771,430 sq. m.	6,409,266 sq. m.	

¹ *Studies in the Genesis and Geography of Soils* (Academy of Sciences of the U.S.S.R., Dokuchayev Soil Institute, Moscow, 1935).

THE MAJOR SOIL ZONES OF THE U.S.S.R.

Tundra Soils

The Tundra zone, situated north of the limit of tree-growth, occupies about 15 per cent. of the territory of the Soviet Union. The annual precipitation is not great, and there is a low mean annual temperature. The rate of evaporation is low, while the permanently frozen subsoil limits the draining off of the surface water during the summer thaw.¹ Consequently, on flat, low-lying areas, there is an abundance of surface water and a strong tendency towards the formation of bog and marsh soils.

Although there is but little vegetation, all the organic matter cannot be completely decomposed and changed into humus under such conditions, so that the soils are characterized by a thin top layer of turf, lying above a thick black or dark grey layer containing partially decomposed organic matter.

Considerable areas are covered with low earth hillocks, the result of internal strain between the frozen subsoil and newly frozen surface layers formed after short periods of thaw. This process causes masses of earth to be squeezed out through cracks in the surface layer. Peat formations often cover the hillock surface. They have been produced by long-continued growth, decay, and accumulation of Tundra vegetation.

On a parent material of light sands, where the soil thaws to a greater depth in summer, there is a greater development of humus, and some leaching occurs, so that the soils are of a weakly developed podsol² type. That is to say, minerals in the *A* horizon are partly disintegrated and washed down to the *B* horizon. The *A* horizon is about one inch thick and

¹ During the winter, when the ground is frozen, the soil-forming processes cannot take place. Consequently the period of soil formation is limited to the extremely short summer. About 30 inches below the surface the soil is perpetually frozen.

² A soil, light grey in colour, from which most of the salts have been washed out, or leached. Such a soil is of low fertility, and may be sandy or clayey in character.

grey-brown in colour. On high ground there are large barren areas quite devoid of soil.

The Light Grey Podsolized Forest Soils

These soils are characteristic of the coniferous forest zone of the U.S.S.R., and, together with the modified podsolized soils of the deciduous and mixed forests, cover about 52 per cent. of its land surface. They are poor, acid soils, usually associated with sands, but also found on clay. They present an important problem for agricultural development.

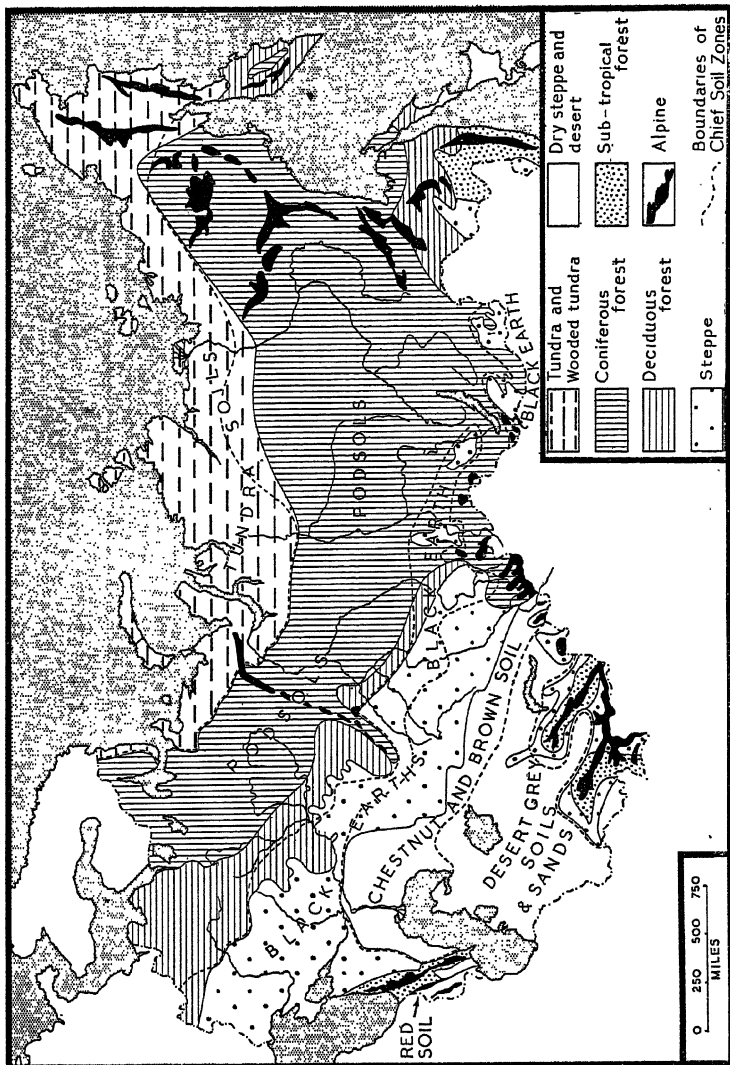
The most essential factors in the origin and development of the podsol-forming process are the presence of humus, the acid reaction of the soil, and the predominance in the soil of a downward movement of water. There is a complete disintegration of the minerals in the surface soil, from which they are removed to lower layers.

The summers are warm enough to allow complete thawing of the soil. The forest cover impedes evaporation, so that the ground is very moist and there is sufficient water to cause leaching.

The coniferous forest vegetation gives rise to a very acid "raw humus" which decomposes only slowly and accumulates as a layer of peaty material above the mineral soil. From this peaty layer, soluble humic acids are produced, which, percolating through the underlying soil, strongly attack the minerals in it, and in course of time will dissolve and remove almost everything except silica, which is little affected by humic-acid solutions.

The uppermost *A* horizon of the mineral soil of a podsol thus consists of a grey-to-white, highly siliceous, leached acid soil, containing but little plant food.

The *B* horizon consists of an upper layer, brownish in colour, containing material (including humus) washed out from the *A* horizon, and a lower layer, yellow or rust-coloured, containing iron hydroxide. The upper layer is very compact, sometimes forming a hard pan composed of soil cemented together by humus substances leached out of the *A* horizon.



At a lower level it changes to a less compact sub-horizon *B*, red-brown in colour, with isolated wedges of humus and iron oxide hydrates.

In badly drained and low-lying areas, and especially on a base of glacial clays, where the ground water lies close to the surface, there is but little downward movement of water in the soil to carry away mineral and organic substances, while there is a lack of aeration. Decomposition of organic matter does not proceed very far. Hence there is a thicker turf or peaty surface layer characteristic of bog and marsh soils. Organic matter from the remains of trees, from forest plants and mosses (especially sphagnum), accumulates slowly. The surface soil has an acid reaction. Surface evaporation causes precipitation of nodules of iron at the base of the *A* horizon. This 'bog iron' has been used for centuries in Northern Russia—for example, near Solvichegodsk, on the river Vichегда, south-east of Archangel. (See p. 290.)

Bog and marsh soils are found most frequently in the coniferous forest zone, to the north of 60° N., but extending much farther south in the low, badly drained areas of the West Siberian Lowland.

Such marsh soils are rare in Eastern Siberia, where the land is high and generally well drained, the soils having been developed upon the products of weathering of old rocks, or upon the alluvium of the river valleys and the lower parts of mid-Yakutia. They are generally of a weakly developed podsol type. The valleys and intermontaine plains of Transbaikalia, however, possess dark brown or black soils, probably due to the greater continentality of the climate, since the higher summer temperatures and low precipitation would favour the formation of humus, and also the formation of soils containing a high proportion of salt. The dark soils of the meadow-steppe may be due to evolution from a previous podsol type of soil formed when the land was forested.

Near the shores of the Pacific Ocean the high rainfall of summer and the deep freezing of the ground in winter result in an abundance of moisture and the consequent leaching

of the soils. They are therefore of a well-developed podsol type.

The Grey Soils of the Deciduous and Mixed Forests

To the south of the coniferous forest zone the relatively heavy precipitation of the deciduous forest zone causes the leaching of the *A* horizon to continue, but the surface soils have a less acid reaction. The warmer summers are more favourable to decomposition of organic matter, with the result that the soil in the *A* horizon becomes darker in colour, and has a fine nut-like structure. The humus content rises to between 3 and 6 per cent., the depth of the layer containing humus increases from seven to nine inches, and the soils become more agriculturally productive. Below the humus-containing layer the soil granules increase to walnut size and become greyer in colour, often coated with ash-grey quartz powder. In the wooded steppe zone the entire *A* horizon may attain a thickness of thirty inches. In contrast to the podsoles there is a very gradual transition from the *A* to the *B* horizon, while earthworms and bacteria are much more active. The whole soil profile is very thick—in some places as much as sixteen feet.

The *B* horizon, four to nine feet thick in the South, consists of a compact upper layer of grey or brown soil in the form of large granular particles, and an equally compact lower layer, reddish-brown in appearance, rich in colloidal clay particles derived from the upper horizons, calcareous, and divided into irregular lumps or columns, prismatic in form.

How far the soils of the wooded steppe zone are the result of the action of man in clearing forests, replacing them by meadow, and improving what was originally a podsolized soil (a process which commenced early in the history of the European part of the U.S.S.R.), or by the extension of forest growth over an original steppe vegetation, thus degrading the black steppe soil, has not yet been fully determined. Degraded black soil is certainly found in the steppe where forests have become established near rivers and on the sides of gullies and ravines.

In Western Siberia the wooded steppe soils have not developed to any great extent. The low relief and bad drainage have resulted in an abundance of marsh soils, meadow podsolized soils, and areas of salt-saturated soil in the south. In the bog and marsh soils of the European part of the Soviet Union, as well as in the West Siberian Lowland, the leached material is deposited not far below the surface, where it forms a compact layer or pan, impervious to water.

The Black Soils of the Steppe

The chernozem, or black earth, forms the most fertile belt of agricultural land in the Soviet Union, covering about 12 per cent. of its land surface. This represents the largest continuous expanse of black earth in the world.

The formation is essentially a result of climate. During the long, cold winter, water accumulates in the soil, providing abundant moisture in the spring for rapid-growing luxuriant grasses. The hot, dry summers and the winter frosts prevent speedy decomposition of organic material, and the low precipitation, combined with a high rate of evaporation in summer, prevents any large amount of leaching in the *A* horizon. Thus the soils are neutral, not acid. The highly developed root system of the steppe grasses is favourable for the formation of humus, which may attain depths of twenty to forty inches, and sometimes even more.

The surface soil is loose and crumbly, deep black or chocolate in colour, granular in structure, with a humus content varying from 6 to 10 per cent. in the northern and central steppe, to 20 per cent. in the south and east. In the lower part of the *A* horizon the soil colour changes to greyish black and finally to brown, with a nut-like structure. Alkaline carbonates formed in the *A* horizon are carried in solution to lower levels.¹ The high rate of evaporation in the warm dry

¹ The minimum thickness of the layer in which carbonates are absent is about three feet. The greatest depth observed is about 56 inches. (See *Studies in the Genesis and Geography of Soils* (Academy of Science of the U.S.S.R., Moscow, 1935).)

summer produces a strong upward water current, causing deposition of mineral salts just below the humus layer. This, and the low precipitation, limit tree growth. In the true steppe, only the slopes of ravines and valleys, where the salts are washed out from the soil, bear woods.

The soils found in these situations are weakly podsolized. Similar soils are also found on sandy terraces and on small areas of flat land on the weakly dissected, plateau-like watersheds in the European part of the Russian steppe.

Towards the north there is less evaporation, owing to the cooler summers, so that there is more downward movement of soil water, and increased leaching reduces the proportion of humus in the soil. Towards the south and east the smaller amount of precipitation accounts for the less luxuriant vegetation and the consequent reduction of the amount and depth of humus in the *A* horizon.

North of the Sea of Azov there is an area which extends eastward towards the Caucasian foothills, in which the black soils are particularly rich and fertile, the humus layer being developed to a depth of more than three feet.

The thick deposits of loess which form the base of most of the area covered by black soils in the U.S.S.R. may well have assisted the growth of the original steppe vegetation. It has certainly caused an extension of chernozem into moister areas, since its porous nature allows superfluous water to drain off rapidly. But loess deposits are not now regarded as the essential cause of the formation of this type of soil, since such soils have been found upon a variety of parent rocks.

It may be said without exaggeration that the crop yields of the black earth zone¹ are limited only by the relatively small amount of moisture which is available, and perhaps also by the ever-present danger of soil erosion, brought about by the wind or heavy downpours of rain during summer thunderstorms. The dry soil is easily washed away, and in extreme

¹ "Rain failures are acute, particularly in the eastern half. Its need is moisture rather than manure. Its period of vegetation is from 180 to 220 days. Despite the favourable soil, it is very liable to failures of crops, which are worst in the east."—SIR JOHN MAYNARD, *The Russian Peasant, and other Studies* (Gollancz).

cases this process amounts to the total removal of the *A* horizon.

The soils of the black earth zone have been cultivated continuously since the time when nomadic pastoralism gave way to settled agriculture, and they continue to yield rich harvests.

The Chestnut and Brown Soils

This zone is developed to its greatest extent in the Asiatic part of the U.S.S.R., where it exceeds the black earth zone in area. The brown soils, as distinct from the chestnut soils, however, are found only in a number of separate areas in the Asiatic part, and are completely absent in Eastern Siberia. On the other hand, they are not found to any great extent in the Turan Lowland, which is largely surrounded by highland, and has therefore become a region of accumulation of loess, the soluble products of weathering from these highlands, the soils being of the grey type.

Chestnut soils occur where there is an extreme continental climate, with a rather low annual precipitation, distributed moderately evenly throughout the seasons in European Russia, but displaying a marked summer maximum in the Asiatic part. The lack of moisture is further accentuated by the high rate of evaporation during the hot, dry summers. Consequently the grass vegetation is not so luxuriant as in the black earth zone, and the humus content of the *A* horizon falls to 5 per cent. in the chestnut soils, and to 3 per cent. in the brown soils, the latter developing under the more arid conditions. The depth of the humus varies from twelve to twenty inches, and the amount falls rapidly towards the drier south-east and east. The entire *A* horizon has a thickness of between twenty and thirty inches in the chestnut soils, and twelve to fifteen inches in the brown soils. In the former the upper part is of a loose stratified structure, and the lower compact. Both display a prismatic structure.

In arid soils the soluble products of weathering are for the most part retained, and distribution of soluble salts occurs mainly through the agency of ascending currents of water. (In humid soils leaching removes the soluble products of

weathering and the water currents in the soil are predominantly downward.)¹

In the chestnut soils neither calcium sulphate nor calcium carbonate are washed deep into the soil, but remain in the upper horizons, while the degree of rock decomposition is so small that there is very little transference of the products of weathering from one horizon to another.

Since in arid regions there is practically no leaching of the products of weathering from the soil, soluble salts of calcium, magnesium, potassium, and sodium, formed by the decomposition of the parent rock, remain *in situ*, and consequently arid soils show a tendency to become saline. This is particularly noticeable in depressions and areas possessing insignificant relief and poor natural drainage, or where the water-table lies close to the surface, further hindering the washing down of salts from the surface to lower levels. In parts of the Turan lowland and the Aral-Caspian depression, for example, salts collect in hollows which are filled with constantly evaporating, and hence brackish, ground-water.

The soil salinity produced by simple weathering is seldom great enough to affect vegetation adversely, but harmful degrees of salinity are found in soils of arid regions subjected to the influence of a high water-table. The water evaporates, leaving any salts dissolved in it in the soil. Such alkaline soils are known as "Solonchak."

They are usually rather loose-textured soils, without definite structure. Sometimes the concentration of salt is so high that a white incrustation is formed on the surface. The predominant salts are usually those of sodium. If for any reason Solonchak soils are subjected to leaching (*e.g.*, by a fall in the water-table, increased rainfall, or irrigation) the soluble salts are removed and an alkali soil or "Solonetz" is formed by the dissociation of the sodium-saturated clay into alkaline soda, or sodium carbonate, and a highly dispersed clay which forms a sticky, unworkable mass when wet, and hard, impervious clods when dry.

¹ See E. Ramann, *Evolution and Classification of Soils*, translated by C. L. Whittles (Heffer, 1928), p. 49.

Alkali soils have a characteristic prismatic structure which becomes columnar in the *B* horizon.

The chestnut soils are generally very fertile, and in this respect are not greatly inferior to those of the chernozem type. Crop production is, however, greatly limited by lack of moisture. Droughts are frequent, and cultivation of the land has to be carried on with great care and foresight. In planning irrigation works attention must be paid to the height of the water-table. If the level rises formation of soil alkali may take place as a result of the processes described above, and the damage to agriculture may be disastrous. This applies equally to chestnut, brown, and desert soils. It can be prevented, however, by treating the soil with calcium sulphate, which converts the deflocculated sodium clay into a flocculated calcium clay, or with sulphur, which is oxidized to sulphuric acid and neutralizes the alkalinity.

Grey Soils of the Desert and Semi-desert Regions

These soils possess a light grey colour. They are found in the lowland plains of the Central Asiatic part of the Soviet Union, to the south of the brown soils, occupying in the main an area of inland drainage, covered with loess deposits (mainly in the south) or products of the weathering of the rocks (sand deserts).

The outstanding climatic factors of the desert and semi-desert regions are the high mean annual temperature, the small amount of precipitation, and the irregular nature of the precipitation from year to year. The summers are hot and extremely dry, with a very high rate of evaporation. Apart from those regions lying near to the foothills of the mountains in the south and along the river valleys, where there is a greater abundance of moisture, there is an accumulation of salts in the soils. Hence the foothill areas are most suitable for agriculture, and here the soils are very fertile when irrigation is practised.

The typical grey soil is alkaline and clayey, with only a small proportion of humus in the *A* horizon (from 1 to 1.5 per

cent.); carbonate of lime accumulates to a great extent near to the surface, and the change from one horizon to another is very gradual and indistinct. Saline soils of the "Solonetz" and "Solonchak" type are common. There is a high percentage of soda, and in very arid regions this leads to complete bleaching of the soil and is the cause of its grey colour.

The sand deserts described in Chapter IV have often been called completely barren wastes. But just as the grey soils of desert and semi-desert regions may yield rich crops of cotton and fruit when suitably cultivated and irrigated,¹ the desert sands may also be controlled and used by man. In fact, sand deserts extend to-day over areas which were cultivated within historic times, and it is now a well-established fact that the movement of the sand and its incursions upon cultivated lands are often the result of the breaking up of the cover of plants especially adapted to life in arid sandy regions, by the herds of cattle belonging to nomadic tribes. A great deal is being done in the U.S.S.R. to-day to control the deserts by planting suitable vegetation on the sands, gradually establishing a vegetational cover which will stop their movement. The saksaul-tree, an important source of domestic fuel in a treeless country, has been extensively planted, and apricots, worm-wood, and the rubber-bearing plant, kok-sagyz, are being successfully grown.

The Soils of Mountainous Regions

In mountainous regions temperature and precipitation vary in a vertical direction, so that the soils also are characterized by vertical zoning.

THE CAUCASIAN MOUNTAINS

The Humid Western Section

The soils of the western slopes of the Caucasus are divided into the following zones:

- (i) *Sub-tropical podsols* or yellow soils, developed upon a

¹ See "Essay on applying Hydrogeological Methods to the Problem of Mineral Fertilization of Sands," by S. S. Sobolev, in *Studies in the Genesis and Geography of Soils* (Academy of Sciences of the U.S.S.R., Moscow, 1935).

basis of yellow or red parent material, occur on the marine terrace.

(ii) Above this zone, where the climate still remains warm, there is a belt of weakly podsolized, brown forest soils.

(iii) This is succeeded by a higher zone of more strongly podsolized brown forest soils.

(iv) Finally there is a zone of sub-Alpine meadow, and Alpine soils.

The Arid Eastern Slopes

These occur in the vicinity of Armenia and the Caspian Sea. As a result of the increase of moisture due to the elevation of the land, the soils change from an arid type on the lower slopes (grey desert soils) through zones of more humid types (chestnut, brown, and black) to the black meadow soils, sub-Alpine, and high Alpine meadow and turf soils.

THE CRIMEAN MOUNTAINS

Since these mountains do not reach the high altitudes of the Caucasian Mountains, they possess only a southern brown forest soil zone and a northern black soil zone, the latter being in effect similar to a vertical zone between the chestnut soils which cover the northern part of the peninsula and the brown soils of the southern mountain ranges.

THE MOUNTAINS OF CENTRAL ASIA

The soils on the slopes are graded vertically from the grey desert soils of the lowlands through a chestnut and black soil zone on the lower slopes to the soils of the sub-Alpine and Alpine meadow type.

The Southern Urals, the Altai, and the Mountains to the South of Lake Baikal

In these areas the climate becomes cooler and moister in proportion to the increase in elevation. Chestnut soils occur

on the slopes near the plains, changing to black soils, and finally to grey podsolized forest soils at greater heights.

The Forest Soils of the East Siberian Highlands

The predominant soils of Eastern Siberia are of the grey forest podsol type, while Tundra soils are widely distributed over the higher mountain tops.

Red Soils

Red soils are found in the neighbourhood of Batum, under sub-tropical conditions of high temperature and heavy rainfall. The *A* horizon is of grey-brown colour, friable, and structureless. It contains a brown humus layer, about sixteen inches thick, and more or less leached. The *B* horizon, whitish or whitish-yellow, is granular in the upper part, and structureless in the lower layers. A lower red or yellow horizon, containing a great deal of clay, only a little silica, and no calcium, may represent the remains of red tropical laterite soils, formed during the Tertiary period. These red soils are of a friable character, moderately fertile, and suitable for the establishment of tea-plantations.

Soil Erosion

The fertility of the soil may be lost in two ways:

1. The proportion of humus which is such an advantage to the farmer who cultivates virgin soil is quickly reduced by continuous cultivation. The store of plant food, particularly nitrogen, is rapidly depleted, and a system of careful crop rotation, combined with the use of fertilizers, is desirable.

2. On the other hand, in those parts of the U.S.S.R. which experience a dry summer, and particularly in those regions where there is no forest and the soil has been formed on a porous loess basis, deep gullies and ravines develop, breaking up the land and destroying the fields. Heavy summer showers may wash away the surface soil. In very dry weather the wind may achieve the same result, especially where the

topsoil has been finely broken up by long-continued cultivation. Soil is also often washed down slopes. In effect, the valuable soils of the *A* horizon are gradually removed.

In the Soviet Union much has been done to combat this menace. Trees have been planted, slopes terraced, and the widespread use of fertilizers, organic manures, and crop rotation has been encouraged. Further details of these measures are given in Chapter VI.

The Application of Soil Science to Agriculture

It is not within the scope of this book to give any detailed account of this subject. The contributions made by soil scientists to Soviet agriculture may be summarized briefly as follows:

1. The classification of soils for the purpose of planning the improvement of the land by means of irrigation, drainage, and the correct use of fertilizers. Land may have excessive, unstable, or insufficient supplies of moisture. Each type requires different treatment, based upon a detailed knowledge of the soils (for example, saline and non-saline soils in arid areas).
2. Providing information for the allocation of the correct types and quantities of fertilizers in different regions and for the development of the mineral fertilizer industry.
3. Assistance in the development of forestry, and the farming and settlement of virgin soils in the eastern steppes of the U.S.S.R. The expansion of the sown area and the introduction of new crops into certain regions.
4. The provision of information relating to the solution of drainage problems, and the effect of freezing and thawing upon different types of surface in the construction of highways, especially in the making of non-macadamized roads.

Natural Vegetation

THE influence of climate upon the natural vegetation of the U.S.S.R. is very apparent. The major zones of natural vegetation lie, like the soil belts, in a general east-west direction, the differentiation from north to south being due to the increase in the mean annual temperature and the decrease in precipitation. The increasing continentality of the climate from west to east is also apparent.

But, apart from the dominant climatic control, there are considerable variations, as, for example, the interpenetration of northern and southern types of vegetation in the central part of the East European Plain. Climatic factors act upon different geomorphological forms within a single climatic zone. There are factors such as variation in relief, elevation of the land, and so on, which may be reflected in the vegetation. The northern boundary of the steppe in European Russia, for example, is influenced partly by climatic conditions and partly by the lime content of glacial deposits.

In Eastern Siberia the extremely dry character of the air allows the forests to extend much farther to the north than in the European part of the Soviet Union. In the Yakut Republic trees withstand the most intense frosts during the winter, where there is but little wind. But in places where strong winds prevail the increase in evaporation makes it impossible for them to survive. Thus there are variations in the vegetation within the same climatic region.

Another factor which must be considered is the evolution of the climate. Types of natural vegetation may have been established in the past under climatic conditions different from those prevailing to-day. Changes in climate within relatively recent times may have caused the spread of new types of plants into regions where they did not grow previously. These processes have probably not yet reached their final limits. For example, where forest vegetation is receding we

may find remnants of the old forest cover within a region which to-day is not predominantly tree-covered. Natural vegetation is, in fact, a reflection of past as well as present climatic and soil conditions.

The present coniferous forests which cover the north of the U.S.S.R. probably spread over the East European Plain from the east. The deciduous forests probably spread from the west and partly from the south. The steppe extended its area from the east. But in addition to the expansion of plant forms since the Quaternary Ice Age we may also find relics of the vegetation which prevailed before that period.

For example, in the Altai Mountains there are considerable areas of forest of a type which was common during the Tertiary period, now forming islands in the sea of coniferous forest. Examples are also to be found in the Southern Urals, while in the central black soil region, Alpine and sub-Alpine plants are found, which plainly have no connexion with the present climatic conditions.

Finally, man has played a great part in changing the landscape. In the East European Plain the mixed and deciduous forests have been cleared for agricultural purposes since very early times. In the deserts the removal of plants which bind the sands together has resulted in the extension of wind-borne sands over large areas which were previously cultivated.

Therefore it must be realized that when we define major regions of natural vegetation we are, as it were, attempting to assess on an average the stage at which a dynamic process, still continuing, has arrived to-day. In every major zone we may find remnants of the old, and indications of the new progressive forms of vegetation.¹

THE TUNDRA ZONE

The long, cold winters, short, cool summers, the perpetually frozen subsoil, and the slight development of the soil-forming

¹ For a detailed account of the natural vegetation of the European part of the U.S.S.R. see "Distribution of Vegetation on the Plains of European Russia," by B. A. Keller, in the *Journal of Ecology*, vol. xv, No. 2 (August 1927).

processes, together with the prevalence of bog and marsh, create conditions under which it is extremely difficult for plants to exist. The low average temperature and precipitation, combined with strong, biting winds in the western half of the Tundra zone, make the growth of trees impossible. The short growing season and the long winter nights strictly limit any kind of growth. Plants with deep roots cannot grow on the thin soils, beneath which there is a subsoil which is always frozen.

In the Far North there are not even bushes. During the summer a grass vegetation springs up, with small clumps of turf separated one from the other and covering vast tracts of higher and drier ground. Throughout most of the European and Siberian Tundra, however, there is a patchy cover of lichens and mosses, with bare spots of clay between. Towards the south there are large hillocks of moss, turf, and dwarf bushes of the heather and berry-bearing types. The blackberry and bilberry are common. Moss, sedge, and cranberry-bushes are generally found in the damper situations, while on higher ground, and on drier sandy areas, lichens, reindeer-moss, blackberry, bilberry, and other dwarf bushes occur. Towards the southern boundary of the Tundra dwarf birches become more frequent.

The typical landscape of the Tundra is grey and monotonous. Only during the short summer does it come to life, when there is a great profusion of small flowers on south-facing slopes. The flowers, like the grassy turf, grow in clusters, separated from each other by patches completely devoid of vegetation, so that they appear like bouquets against the background of dark soil. The patches of higher ground, and sandy and stony plateaux, are like oases, where the ground is drier and less saturated. The snow melts more quickly and the soil is more easily warmed by the sun. Only in such situations can flowering plants grow in the Tundra. Between the hillocks upon which the flowers and bushes grow there are swamp and bog-filled hollows.

Snow lies all the year round in the deeper hollows and forms ribs along the sides of low hills during the summer.

Along the flats near the rivers sandy patches, close to the water but relatively well drained, are covered with dwarf willow-scrub. A similar growth occurs on hillsides where they are protected from cold winds. The scrub is a valuable source of fuel for the native peoples.

In situations where water remains standing throughout the summer—both in low-lying areas and in depressions on higher ground—moss-bog is found, while near river deltas large quantities of driftwood, covered with alluvium, form islands of quaking-bogs.

The transition from the Tundra to the coniferous forest which lies to the south is very gradual. First single trees appear, then groups, and finally the Tundra is dotted with small forests. The first trees to be seen in the forest-Tundra country are thin, misshapen things, often bent so that they grow parallel to the ground, in order to avoid the wind. There are many withered and dead trees, the product of the expansion of bogs. The growth of moss causes the ground-water to come up close to the surface, and deprives the trees of moisture. It also raises the level of permanently frozen subsoil, so that winter frosts more easily kill the trees. In this way the Tundra zone gradually extends towards the south.

At the end of the short growing season life practically ceases in the Tundra. By the end of September the land is silent, and only the Polar partridge and the Arctic owl are left to share the solitude. Most of the animals migrate south towards the borders of the coniferous forest. The fox and the ermine are of especial value, as their white winter furs fetch high prices. In the summer, when the ground thaws and the mosses, lichens, and flowers begin to grow, the Tundra becomes alive. Masses of birds fill the air with their cries. Swans migrate to the Tundra in hundreds and thousands. Along the coast the shore is white with eider-duck, seagulls, geese, snipe, and swans. In some places it is impossible to walk over the ground without treading on nests and eggs. The fur-bearing animals go north, too, and herds of reindeer migrate from the coniferous forests. The reindeer, lemming, Arctic fox, hare, wolf, and ermine are typical animals of the

Tundra. The lemming, which lives and feeds beneath the snow during winter, is eaten by birds and animals in the summer. The fox is generally found on higher ground, feeding on lemmings, birds, and eggs. The hare too keeps to the higher parts of the Tundra.

Among the forest animals which migrate into the Tundra are the glutton, brown bear, fox, and vole, while practically all the birds are migratory, since they cannot withstand the severe northern winter.

The dog and the reindeer alone make any kind of human life possible. The deer is able to feed upon mosses, which remain during the winter under the thin cover of snow. Since the deer wanders about and migrates in search of food, and since he has to avoid the swarms of mosquitoes which make life unbearable during the summer months, man too must lead at least a semi-nomadic life. Along the estuary of the Yenessei, where driftwood is available for fuel, there are permanent settlements. Here fishing, goose-hunting, and trapping form the main occupations, and the dog is the chief domestic animal.

Throughout regions where there is not sufficient food for the reindeer the dog is invaluable. The native dog is fed almost entirely upon fish. The rivers teem with fish during the summer, and they can be caught through holes in the ice during the winter. Very often, however, fish are caught during the summer and then allowed to freeze in great heaps during the autumn, thus providing a permanent supply of food for the dogs for the remainder of the year. Apart from its value as a means of transport, however, the deer is superior to the dog in that the former may also supply food, clothing, and shelter.

THE TAIGA, OR CONIFEROUS FOREST ZONE

The forests of the U.S.S.R. occupy about 38 per cent. of its surface, the coniferous forests alone comprising about one-third of the forest lands of the world, extending 3600 miles from west to east and 600 miles from north to south. In Siberia almost the whole of the land is covered by trees, and

in Eastern Siberia (east of the river Yenesei) they extend farther to the north than in any other part of the Soviet Union. This is partly due to the fact that the waters of the great rivers, flowing from the south, are relatively warm and have a noticeable effect upon the vegetation near the rivers. In the north there is evidence of the penetration by the Tundra. The ground is often covered with mosses and lichens, while berry-bearing bushes extend far to the south.

The short period of vegetative growth (three to four months) limits the number of tree species to spruce-, fir-, and larch-trees, which have little leaf surface, so that transpiration is reduced. Although the amount of precipitation is low, the rate of evaporation, owing to the cold climate, is also low, so that there is enough moisture for tree growth. The winters, however, are not cold enough to prevent the growth of trees, the snow cover offers some protection to the soil, and the summers are very warm (see Fig. 12).

In the European part of the coniferous forest zone the spruce and fir are the dominant trees, growing mainly on moist clayey soils, while there are considerable areas of pine in drier sandy situations, especially towards the north. The soils are acid, cold, infertile, and badly aerated.¹ The moss cover which is so common prevents aeration and limits the growth of grass, and often reduces the quantity and quality of meadows, especially in those parts which are not subject to flooding in spring.

The highest points in the Urals have a Tundra vegetation. But the greater part of the slopes are forested, with spruce and larch predominating in the north, and pine, birch, and larch in the south.

The Siberian forests extend in the south to 56° N., covering the slopes of the Altai and Sayan Mountains, and much of the highland regions of Transbaikalia and the Amur basin. The chief trees of Western Siberia are fir, cedar, spruce, stone pine, and Siberian larch. The "Urami," a mixture of marsh and forest, covers large areas. In South-western Siberia, and especially on the slopes of the Altai, the fir and

¹ They may be of a clayey, sandy-loamy, or sandy type.

cedar are the typical trees. The 'leaf' trees, birch and aspen, are very common, and, together with alders, willow, and mountain ash, often form considerable thickets.

The most valuable tree of the coniferous forest is the larch. It is a large, tall tree, with hard wood, and is often called the Siberian oak. It is most abundant in Eastern Siberia, where it is found farther north than any other tree, and provides a continuous unbroken mantle over the mountains. Highly resistant to decay, it is greatly valued for housing construction. It accommodates itself very well to frozen, dry, wet, or turf soils.

In the deep valleys of Transbaikalia pine forests are frequently seen, and they occur also in the valley of the middle course of the Lena. In the extreme north of Siberia the Siberian fir is never seen.

The spruce and fir forests of European Russia and Western Siberia have a gloomy and mournful appearance. The thick cover of trees shuts out the light of day and favours the growth of moss in damp situations and on the decayed stumps of trees and fallen branches. Lichens with long, trailing grey tendrils hug the tree-trunks.

Where bushes and grasses are able to grow they are usually of a bleached, pale character. The flowers lack colour and are often white. These gloomy forests are also silent. The cries of birds and animals are rarely heard, and the deep stillness is broken only by the squirrel as he cracks his nuts, the tapping of the woodpecker in search of insects, or the cracking of branches and twigs under the heavy tread of a bear. In South-western Siberia, birch and aspen bring variety to the forest; there are more open spaces in which tall, rich grass and ferns, juniper, bilberry, raspberry, crowberry, and strawberry grow, and the atmosphere is altogether lighter and happier than in the black forests of the north.

Exploitation of the interior forest lands is limited by lack of transport, and although this has to some extent been overcome by the utilization in summer of the Siberian rivers in conjunction with the Arctic sea route, large forested areas still remain untouched.

Climatic conditions limit agriculture to the growth of rye, flax, and vegetables in forest clearings, together with some cattle-rearing in meadow regions. Settlement is confined almost entirely to river valleys and the shores of lakes and seas. Hunting, fishing, and lumbering usually predominate over agricultural occupations.

THE MIXED AND BROAD-LEAFED FORESTS

The more open character of the forests along the southern border of the coniferous forest zone, and the prevalence of trees of the leafed varieties, mark the transition to the broad-leaved, deciduous forest zone. Whereas the coniferous forests give an undergrowth of Tundra character (mosses, etc.), the leaf-forests provide a thick cover of decayed leaves on the ground, antagonistic to the growth of moss. There is a greater development of humus, and the soil has a less acid reaction. Consequently the undergrowth consists mainly of perennial grasses, introducing into the forest the beginnings of the steppe vegetation which prevails still farther to the south.¹

In Eastern Siberia the increasing continentality of the climate prevents the development of the leafed forests. In Western Siberia lack of moisture and severe winters restrict the development to a narrow belt of small-leaved trees such as the birch and aspen. In European Russia, however, the penetration of oceanic influences results in a more humid climate, which at the same time is slightly more temperate, so that the transitional zone of mixed forests is followed by a large area of broad-leaved deciduous forests, contained roughly within the Leningrad-Kiev-Moscow triangle. The oak, lime, maple, and ash are the most common trees. The oak is found mainly on clayey, semi-podsolized soils. The lime extends farther to the north than the others. The limit of the growth of the oak is a line drawn between Leningrad

¹ "The oak region is a field of battle between forest and steppe where under natural conditions the forest will obtain the upper hand."—B. A. KELLER, "Distribution of Vegetation on the Plains of European Russia," in the *Journal of Ecology*, vol. xv, No. 2 (August 1927).

and Perm. Maple- and elm-trees are found a little to the north of this line, while the ash flourishes towards the south. Across the Urals the lime is occasionally to be seen, but as we have already pointed out, the broad-leaved trees are confined mainly to a zone west of the Urals.

The deciduous forest region has played a most important rôle in the early development of the Russian State. It may be said that the Russian State was, in fact, born in the broad-leaved forests. Thus from early times the land has been used for agriculture, and a great deal of the forest cover has been removed.

Because of the protection afforded to the Slav peoples against the attentions of neighbouring tribes, the forests provided a favourable environment for the growth of the first agricultural (and hence settled) communities, since the higher areas of land upon which the people first settled were separated from one another by extensive areas of bogs and marsh (see Chapter I).

Later these areas created difficulties for the expansion of agriculture, especially great since nearly 50 per cent. of the coniferous and deciduous forest zones of the U.S.S.R. is occupied by marsh or bog. Many of the marshes occupy the sites of old lakes, which gradually filled up with alluvial deposits and became overgrown with successive types of marsh vegetation. Others have been caused by the irrational system of tree-felling often practised in the past, when the stumps were left in the ground, and dead trees and branches were allowed to lie and decay, so that a moss cover gradually spread over the soil, raising the ground-water towards the surface. The process by which marshes gradually encroach upon forests has been described above.

The greatest areas of marsh are found in Western Siberia, in both the coniferous and leaf forests. East of the Yenesei the higher and better-drained land, together with the low amount of precipitation, brings about the almost complete absence of marsh and bog. In the East European Plain, however, they are very common.

The Soviet Union possesses a greater area of bog- and

marsh-land than any other part of the world of similar extent. In the past this was regarded as a serious disadvantage. But within the past few years great achievements have been recorded in the utilization of peat from bogs. Some of the most important electric power stations now work entirely on this type of fuel. Manure, litter for animals, and chemical products are obtained from peat. When the lands have been suitably drained, and fertilizers applied, large crops of vegetables have been raised on former bog-land.

While large areas of the deciduous forests have been cleared for agriculture most of the coniferous forests remain to-day in their virgin state, agriculture being confined to the natural meadows of the river valleys. The value of the coniferous forests lies chiefly in their supplies of timber and valuable fur-bearing animals.

THE STEPPE ZONE

Between the forest zone of the north and the steppe zone of the south there is a transitional region, usually known as the wooded steppe zone. The forest gradually becomes more open, light, and sunny; there are woods and coppices with grassland between them. In favourable positions, especially on the sides of ravines and valleys, thick woods may develop, consisting of a cover of oak, lime, maple, and elm, with an undergrowth of hazel- and spindle-trees, mixed with briar on the outskirts of the woods. In the west hornbeam-, plantain-, pear-, and cherry-trees, and blackthorn- and hawthorn-bushes, are very common. In the south the woods and coppices become more and more infrequent. The expanses of open steppe between the woods become greater, until finally trees occur only along the sides of valleys and ravines.

The zone of true steppe occupies about 12 per cent. of the territory of the Soviet Union and corresponds to the fertile zone of black earth. The climate of the steppe is characterized by great annual variation in temperature and rainfall. The rainfall is about 16 inches in the west (near Odessa), but decreases rapidly towards the east. It falls mainly in spring or early summer. Tree-growth is therefore limited

both by drought and great heat in summer, when dry winds parch the soil, and by the fact that in winter, owing to severe frosts, the ground is physiologically dry. Trees, therefore, are found only near lakes and rivers, and it is in the valleys that human settlement is most dense.

The country is generally level or rolling, open, and treeless, often lying on a plateau surface from 600 to 1000 feet above sea-level.

. . . A boundless, rolling plain, a sea of herbage scarcely broken by hills of any size, and transected here and there by great rivers. . . . The houses and townships are few and far between, and they, and such grass and trees as can grow, are hidden in the hollow, so that the eye can pass from one ridge of grassland to another, until all melts into the distance.¹

The level surface, however, is often dissected by gullies and ravine-like valleys, along which, as also along the sides of the valleys of the main rivers, the trees of the wooded steppe zone penetrate.

The present open steppe country was never forested, although it is probable that forest growth has extended over the northern parts of the original steppe zone since the end of the Ice Age.

The vegetation of the steppe responds very closely to the change of the seasons. The spring thaw comes suddenly; the warm sun and showers of rain which fall at intervals favour the growth of flowers, and before the shade of the tall grasses is established the soil is carpeted with the hyacinth, the purple and yellow iris, the crocus, and red and yellow tulips. The song of birds fills the air. At night the nightingale breaks the silence with its song.

The spring flowers gradually give way to the growth of various types of grasses, the exact types varying with local conditions. In late spring the colour of the landscape is fresh and green, but with the commencement of summer it changes

¹ M. D. Haviland, *Forest, Steppe and Tundra* (Cambridge University Press, 1926). For excellent descriptions of the steppe and steppe life, see the short story *The Steppe*, by A. Chekhov, and the novels *Quiet Flows the Don*, *Virgin Soil Upturned*, etc., by M. Sholokhov.

to grey. By the middle of July the grasses have reached their full growth. Feathergrass, greyish-silver in colour, gives the steppe its characteristic appearance of a sea upon which the breeze stirs up gentle waves. Among this waving sea of grass there stand out spots of cornflower, bluebells, and sage, or the dull green of steppe bushes.

During the second half of the summer the sea of grass begins to fade under the scorching rays of the hot sun. New types of growth appear, dull and insignificant in appearance, but well able to withstand the heat and drought. The steppe becomes cheerless. Under the dull blue sky the birds are silent, and only the chirp of the grasshopper can be heard. A whirlwind may sweep across the plains, twisting and turning as it carries earth and dried grass high into the sky, only to scatter them again over the land. The streams shrink and dry. Rain seldom falls, except in occasional thunderstorms, which rapidly change the landscape into a sea of mud but give little moisture to the parched earth, since the water runs off the slopes very quickly.

In the winter the steppe is swept by cold, bitter winds, and the landscape assumes a monotonously white appearance.

To-day there remain very few large expanses of virgin steppe. The fertile black earth has been ploughed up. The remnants, together with the rich farmland which was originally part of the steppe, extend from the European part of the U.S.S.R. across the Urals into the vast level black-soil plains of the southern part of Western Siberia. These plains are characterized by the occurrence of thousands of small fresh-water or salty lakes, while groves of birch-trees are common in many parts.

Finally, mention should be made of the mountain steppe regions. They extend along the lower slopes of the Altai to a height of more than 1000 feet, while along the valleys they continue up to about 3250 feet. In Eastern Siberia the intermontaine plains possess a cover of steppe vegetation which forms islands amid the sea of forests. Each 'island' has its own particular name—the Minussinsk Steppe, the Abakan Steppe, etc. In Transbaikalia steppe vegetation

covers the slopes of the mountains, often in conditions of perpetually frozen subsoil. In the Tian Shan and the Pamir the steppe extends on the drier slopes to over 10,000 feet.

THE DRY STEPPE OR SEMI-DESERT ZONE

A wide strip of dry plains extends to the north of the Caspian on both sides of the Volga, and farther east as far as the Chinese frontier. The surface is very even, with only a few low hills rising here and there. These plains occupy about 9 per cent. of the Soviet Union.

Large areas of the soils are saline, with the salts often coming close to the surface, especially in the Aral-Caspian depression. On the "Solonetz" and "Solonchak" types of soil there is a cheerless growth of plants especially adapted to the saline conditions and lack of moisture. They have thick, juicy leaves, often bearing prickles. Even in those parts of the plains where the soils are not saline, vegetation is dry and scant, with bare areas between patches of grass, and bushes of tamarisk. In other parts large areas of the plains are covered entirely with wormwood. Plants in these arid regions usually have a very short cycle of growth. Many of them have a completely dead appearance during the heat of summer, but after a shower of rain they seem to revive, and the parched grey colour changes quickly to a fresh green.

The dry steppe supports enormous numbers of cattle, horses, sheep, and camels. A great expanse of the poor dry steppe is required to feed a herd, so that the nomadic herdsmen are compelled to wander from one pasture to another. Deep wells are very important, since rivers and streams are few and often dry up during the summer.

THE DESERT ZONE

The climate of the deserts—short, cold winters and long, hot, dry summers, when the burning and scorching effect of the sun is often enhanced by strong, dry winds—allows the development of only the most scanty form of vegetation,

consisting of plants which have long roots, enabling them to draw moisture from deep below the ground. The leaves are exceptionally small, often protected from the rays of the sun by a covering of thin, downy hair. Many plants have no leaves at all.

The Sandy Deserts

These are derived by wind erosion from the original marine deposits. There are separate sandhills and also 'ranges' of hills, attaining a height of more than 30 feet. Very often the lighter sands are blown from the surface by the winds, and form lower hills upon which grow long-stemmed, leafless, and branchless plants. They offer but little resistance to the winds, while in a particularly strong wind their deep roots prevent them from being blown away. During the night the atmosphere cools very quickly, owing to the cloudless sky, and enables a certain amount of moisture to condense upon the upper layers of sand. This enables a second layer of vegetation to become established—short-rooted plants.

In addition to such plants, the 'tree' of the desert, the saksaul, is often found. This 'tree' grows to a height of from 20 to 25 feet. Its wood is hard, heavy, and very brittle, providing excellent firewood, the only fuel in a treeless country. These trees often form small forests, but the leaves are so small and narrow, and the foliage so scanty, that they offer no protection from the sun. There is no shade, nothing to bring relief from the dry, sandy, dust-laden atmosphere. The silence is terrifying, for no living thing can find refuge in these woods, neither bird nor animal.

As the wind gradually fills up the depressions between sandhills the types of vegetation described above begin to cover the entire area, and the original sandy desert begins to have the appearance of semi-desert, or desert-steppe. There can be no doubt that formerly the true desert covered a much smaller area than is the case to-day. But the herds of the wandering nomads tend to break up the vegetation-cover and thus cause the land to revert to desert. The Soviet Government has encouraged the planting of the saksaul-tree,

as well as other types of suitable plants, and by controlling the grazing of animals it has been possible to reclaim large desert areas.

Nevertheless, there are still large areas of unproductive and lifeless desert, such as the Kara Kum and Kizil Kum, where the dry, burning wind of summer lifts thick clouds of sandy dust, which obscure the sun and make travel unpleasant and difficult. Irrigation has made possible the reclamation of certain areas where it has been possible to obtain water from rivers or wells.

Clay Deserts

The Ust-Urt Plateau, Bet-Pak-Dala, and the land to the west of Lake Balkhash consist of flat, barren clay plains, a sea of dirty grey colour, with only the most meagre vegetation cover, as monotonous as the grey clays which separate the patches of wormwood of which it is largely composed. The grey soils are fertile if they are irrigated, and to-day some areas yield crops of cotton, grapes, and other fruits.

Lake-shores and River Deltas

The importance of water in the desert is well illustrated by the remarkable fertility of those parts which are situated near to lakes or around the delta of a river. The vegetation around the Amu Darya delta, on the Aral Sea, has the special name of "Tugai." This signifies the woods of poplar-trees, tamarisk, etc., which grow over the land where floods occur. Over the land between the streams of the delta, and on the sandy shores of lakes and rivers, there is often an immense growth of rushes, over 12 feet in height. These thickets are the haunts of tigers, leopards, wild bear, and deer, as well as pheasants and other birds.

SPECIAL TYPES OF VEGETATION IN MOUNTAINOUS REGIONS

In the southern and far eastern parts of the Soviet Union there are small but extremely interesting regions where forests

have continued to exist since the Tertiary period. They are usually a mixture of broad-leaved and coniferous trees, existing in conditions of warmth and moisture which approach those which were prevalent in these areas during the Tertiary period.

Western Transcaucasia

Along the coast of the Black Sea, between Sochi and Batum, there is a small region known as Kolkhiz, where the climate is distinguished by extremely heavy rainfall and a high average annual temperature. The vegetation is thick, luxuriant, and almost impenetrable. There is a great variety of plants, including trees such as the beech, hornbeam, and white poplar, overgrown with lianas, wild grapes, and ivy. The thick green forest cover shuts out the rays of the sun, and between the trees there is a dense undergrowth of prickly and evergreen bushes—hawthorn, holly, cherry, laurel, and rhododendron. There are ferns which grow to the height of a man, and others which are tree-climbers. In the spring the lianas and bushes are covered with flowers possessing a strong aromatic scent.

Some trees grow to a height of from 40 to 50 feet before they are eight years old. Near Batum the Japanese bamboo reaches a height of 20 feet within five weeks.

The South-eastern Caucasus

An area possessing similar climatic conditions is found near the shores of the Caspian Sea. It is called Talish, and is situated near the town of Lenkoran. The typical trees of the forests of this region are the chestnut, oak, and the ironwood, with an undergrowth of box, wild quince, pomegranate, and mulberry.

These two areas are of great importance to the agricultural economy of the Soviet Union, since it is possible to grow olives, grapes, lemons, oranges, mandarins, and tea. These regions are usually referred to in Russian works dealing with agriculture as the "sub-tropical regions." In addition to the

luxuriant growth of vegetation such animals as the tiger, hyena, panther, jackal, and porcupine are found.

The Amur-Ussuri Region

Close to the borders of Manchuria, in the middle courses of the Amur and Ussuri rivers, there is a region which enjoys a climate transitional in character between that of the Taiga, or coniferous forest to the north, and the monsoon type of climate experienced farther south.

The transitional nature of the climate is reflected in the natural vegetation. In the river valleys there are damp, luscious meadows. Large areas of the hillsides, as well as considerable areas of flatter land, are forested, with a mixture of fir and Manchurian nut, pine and cedar, as well as extensive broad-leaved forests of oak, lime, cork-oak, and elm. Apricots and peaches grow wild. The undergrowth is thick and luxuriant, often almost tropical in appearance, with lilacs, acacia, wild grapes, many types of lianas, and giant ferns. Near to the shores of lakes and rivers the lotus and giant water-lily grow. The animal life is equally exotic. The tiger and the deer, the panther and the sable, are found in the same district. There are leopards and squirrels, musk-ox and bears, antelopes and weasels, Egyptian ibis, larks and pheasants.

The valuable timbers of these forests have an enhanced value owing to their proximity to the Pacific Ocean and the ease of transport along the great rivers.

The Poorer Forest Zones of the Crimea, Caucasus, and Middle Asia

The Crimea. The northern slopes of the Crimean Mountains are forested to a height of 500 feet, with oak and the small-leaved hornbeam on the lower slopes, and beech forests on the higher mountains. The highest slopes are covered with pines. In the Yaila the forests attain a height of 2600 to 5200 feet. The dry limestone surfaces of the tops of the ranges are treeless.

There is a marked difference between the forest cover of the northern and southern slopes in the Crimea. The southern slopes have a definitely Mediterranean type of vegetation, with many evergreen trees, including the juniper. The lower slopes have forests of cypress and Lebanon cedar, the middle slopes are clothed with oak, and the highest parts with pines.

The Caucasus. The finest forest growth occurs in the wetter, western part of the Caucasus, where the lower slopes are covered with oak and ash, pear, apple, and maple, with alder and willow in low-lying and damper situations. Beech forests cover large areas of the upper slopes, while the oak, hornbeam, ash, lime, and maple are commonly found. The beech forests themselves, however, rarely contain other types of tree. They provide a thick cover overhead, shutting out the light from the ground, which is covered with mosses, and, in places, with bushes of azalea and thick ferns.

The very high mountain-sides are clothed with pine forests, or giant firs, such as those on the steep approaches to Mount Elbruz, which grow to a height of 180 feet.

Middle Asia. The mountains of Middle Asia possess no large, thick forests, although woods are to be found on almost all the hillsides. Along the sides of the gorge-like and ravine-like valleys of the Kopet Dagħ Mountains figs, junipers, and special types of bushes and shrubs grow. At the western end of the main mountain masses of Middle Asia—in the valleys of Zeravshan and Ferghana—the lower hillsides are treeless, with only occasional patches of pistachio, almond-tree, ironwood, and maple. At about 3200 feet the characteristic trees of Middle Asia appear—the nut, apple, and apricot. The eastern ends of the ranges, however, support coniferous forests, which in the Tian Shan occur only in the valleys and on the sides of gorges, so that from a distance the mountains appear as masses of red sandstone, red and grey granite, glinting golden in the sun, with dark blue shadows. Middle Asia is characterized generally by the absence of the oak and lime.

ALPINE OR HIGH MOUNTAIN VEGETATION

Below the snowline, which varies in mountain regions, with the precipitation, altitude, and aspect of the hill-slopes, Alpine vegetation is often found.

In the Far North there is a tendency for the Alpine vegetation to be replaced by Tundra. In the Far East and Eastern Siberia the greatest elevations are usually barren, devoid of any soil or vegetation. Otherwise the mountains and highlands are completely clothed in forest.

DISTRIBUTION OF FOREST RESOURCES OF THE U.S.S.R. (1935)

REPUBLIC, REGION, OR TERRITORY	PERCENTAGE OF FORESTED LAND IN EACH AREA	PERCENTAGE OF STANDING TIMBER IN U.S.S.R.
Northern Region . . .	45.6	8.8
Karelian Republic . . .	56.5	1.4
Leningrad Region . . .	30.8	1.7
Western Region . . .	23.5	0.5
Kalinin Region . . .	14.6	0.3
Moscow Region . . .	27.1	0.6
Ivanovo Region . . .	31.3	0.7
Gorki Region . . .	41.1	0.9
Kirov Region . . .	37.3	0.9
Kursk Region . . .	6.4	0.2
Voronezh Region . . .		
Sverdlovsk Region . . .	58.2	3.3
Cheliabinsk Region . . .	18.6	0.5
Omsk Region . . .	10.8	2.8
Bashkir Republic . . .	33.2	0.8
Tartar Republic . . .	15.6	0.2
Kuibishev Region . . .	11.8	0.5
Orenburg Region . . .		
Stalingrad Region . . .	2.7	0.2
Saratov Region . . .		
Azov-Black Sea Territory . . .	10.9	0.3
North Caucasus Territory . . .	5.5	0.2
Crimean Republic . . .	7.2	0.0
Kazakh Republic . . .	6.5	3.2
Kara Kalpak Republic . . .	55.7	1.2
Kirghiz Republic . . .	4.9	0.2
West Siberian Territory . . .	37.1	5.2
Krasnoyarsk Territory . . .	36.1	13.2
Yakut Republic . . .	47.7	24.7
East Siberian Territory . . .	39.7	12.1
Far Eastern Territory . . .	23.4	11.9

The Alpine meadows of the Caucasus, the Altai and mountains of Middle Asia, support millions of head of cattle, which are reared on the lower plains during the winter and fattened in the high meadows during summer.

GAME PRESERVES AND NATIONAL PARKS

With the extension of the activities of man, there is a strong tendency for the natural vegetation to be removed. In this way plants and animals which may be of great value to man may be completely exterminated. In the Soviet Union thousands of square miles of land are being preserved in national and regional parks, some of which comprise huge unpopulated areas. The largest of these are situated in the Urals, the Altai, the Caucasus, the Kola Peninsula, and the Sikhote Alin. In these reserves the natural vegetational zones are preserved, and many varieties of animals are able to breed freely.

The Geographical Background of Russian Historical Development

RELIEF, rivers, vegetation, and soils have all played an important part in the growth of the Russian State.

The immense extent of the Russian Plain provided an area throughout which the state was able to expand without meeting any serious natural obstacles, and at the same time provided no region separated from the rest of the plain by physical features, which might have become the nucleus of another, rival, state. The original Russian State grew up in, and expanded from, the deciduous forest zone.

The essential factor in this growth was the strong differentiation between the Leningrad-Moscow-Kiev triangle of deciduous and mixed forest lands (covered with morainic hills, marshes, and lakes, and forming the sources of the main rivers of the East European Plain), and the remainder of the Plain (the coniferous forests and Tundra to the north, and the Steppe to the south and east).¹ Across the whole of the East European Plain the rivers and river valleys provided the main ways of movement and expansion and served as transport arteries which bound the whole country together.

The rivers rise at moderate heights within the Leningrad-Moscow-Kiev triangle: the source of the Dnieper lies at 800 feet above sea-level, while the Volga rises at a height of 740 feet. Between the upper reaches of the rivers the rise in the land is only slight, owing to the low glacial topography, and at an early date portages were established between one river and another, but all within the deciduous and mixed-

¹ "The forest and marsh zone is of special historic interest; here the Slavs settled after the devastation of the fertile steppe by nomad hordes, and here was consolidated the Great Russian Empire which later re-absorbed the steppe."—R. M. FLEMING, "An Outline of Some Factors in the Development of Russia, with Special Reference to European Russia," in *Studies in Regional Consciousness and Environment* (Oxford University Press).

forest triangle mentioned above. Between the Baltic and the Black Sea, along a line from the Dnieper to Lake Ladoga, the Russian Plain narrows, so that there is a short line of communications from north to south.

Over a thousand years ago boats were sailing along the Dnieper from Constantinople to the Varangians, Norse people of Scandinavia. Slaves were taken to Greece, and wines, fruit, honey, horses, and furs were carried northward to the Baltic lands. A portage had to be made around the rapids, near the site of the present Dnieper Dam, where the river crosses the outcrop of old, hard rocks which constitutes the Podolsk-Azov shield. Not far from the modern city of Smolensk there was another portage to the West Dvina river, and then another to the river Lovat, along which the boats passed to Lake Ilmen, the Volkhov river, and Lake Ladoga, from which they followed the Neva to the Gulf of Finland and the Baltic Sea. (See Fig. 5.)

In the lands lying near to the rivers the Slav peoples of the deciduous forest zone came under the control of the Varangians.¹ To the south the steppe lands were inhabited by nomadic peoples belonging to various tribes which were constantly invading the southern part of the plain. Thus the Varangians were compelled to organize fortified towns along the Dnieper and unify the surrounding lands. Kiev was the most important of these towns, and the Kiev principality may be regarded as the earliest Russian state. At the other end of the trade route the town of Novgorod was founded. Eventually the Varangians were assimilated by the Slavs, and the towns became the centres of Slav principalities. In A.D. 882 Prince Oleg of Novgorod conquered Kiev. The domains of Novgorod and Kiev eventually extended together as far east as the Volga and the Urals, and as far north as the Pechora river and the White Sea. The lands of the Kievan princes became known as "Kievan Russ," and Kiev is regarded as the mother of Russian cities.

¹ The home of the Slavs before the migrations which took place between the fifth and eighth centuries A.D. was in the country between the middle Vistula and the upper Dnieper. The invasion of the Huns caused them to migrate eastward.

"Kievan Russ," however, was essentially a unity based on commerce. By the tenth century the Slavs had established numerous settled communities in the forests, and agriculture developed rapidly during the next two centuries. The growth of agriculture temporarily broke up the original Russian unity, and from A.D. 1068 to 1100 there were wars between the various Russian princes,¹ in addition to attacks by the nomadic peoples of the South.

We have already observed that within the Leningrad-Moscow-Kiev triangle the annual precipitation is higher than in the southern and eastern parts of the East European Plain; the winters are milder than in the east and north, while the summers are longer and warmer than those experienced farther to the north. The drier steppe lands supported the herds and flocks of the nomadic peoples who were compelled to wander in search of new pastures, and the scant population of the coniferous forests and Tundra consisted of nomadic hunters and reindeer-breeders. The Slavs, however, were able to take advantage of the more favourable climatic conditions on the one hand, and clear the forest and form settled agricultural communities, and on the other to take advantage of the protection afforded them by the forest and marsh against nomadic invasions.²

The soil was not exceptionally fertile, and the showers which tend to fall towards the end of the summer made the growth of wheat difficult. But it was possible to grow rye and oats, and to rear cattle on the meadows, while flax provided the basis of the homespun linen industry for clothing.

During the long, cold winters there was little farm-work to be done. It was possible to supplement the precarious

¹ "The Slavs of the steppe fringes, weakened by the internecine warfare of their princes, by the spread of slavery, and by attacks of nomads, spread ever northward into the inhospitable forest and marshlands; they faced the new problem of a difficult natural environment rather than the old one of seeking to unite the warring principdoms against the common Tartar enemy."—R. M. FLEMING (*op. cit.*).

² "In terms of human geography the recent history of Russia may very largely be described as the advance of the agricultural wedge against both hunters and nomads."—D. S. MIRSKY, *Russia: A Social History* (Cresset Press, 1931).

agricultural income by spinning and weaving and the making of wooden articles. These handicraft industries became regular occupations, later to be developed into a national folk art. The traditional skill in spinning and weaving was still later of importance in the growth of the factory textile industry. There was hunting in the forests and fishing in the rivers. There was an abundance of timber for the construction of houses and fortifications for the defence of the towns. The Russian peasant is renowned as an expert in the use of his axe, with which he is able to fell the trees and shape the timbers for his dwelling.

These townships and villages were frequently established upon the sides of morainic hills, where the soil was drier, warmer, and better drained than in the low, lake-strewn, marshy country between them. To-day one may observe a concentration of villages upon these hills, while roads and railways follow them in a general south-west-north-east direction, and canals run in the lowlands between the hills. The line of older and more eroded moraines separated the rival states of Tver and Moscow, while this was also the line of advance of the invasion of 1812, and it was later followed by the Warsaw-Moscow Railway.

This type of forested marshy country was particularly difficult for cavalry invasions by the nomads.

Along the southern borders of the deciduous forest lands, the transitional zone of wooded steppe was for long the scene of the struggle between the sedentary, agricultural way of life and the wandering nomad way. The Russians set up a series of forts in this zone, and it was along the narrow belt of wooded steppe that they eventually moved into and colonized Siberia.

The Russian communities were at first confined to the morainic heights and the plateaux between the upper courses of the great rivers. The low-lying plains of the upper Don and Oka remained as battlegrounds in their struggle with the nomads. The right bank of the upper Don was particularly useful in this struggle, since it consists, for about 200 miles, of high calcareous cliffs, ideal for defence.

We have already observed in Chapter IV that the wooded steppe country penetrates into the true steppe along river valleys and ravines. The valleys provided trade routes from north to south, and from the Middle Ages the chief commercial centres were towns situated at bridgeheads, where the rivers were crossed by east-west overland routes. Examples of such towns are Saratov, Rostov, Kuibishev, Gorki, and Kiev.

It was along the valleys that the Russians gradually penetrated into the south. Peter the Great built his famous Don flotilla on the river Voronezh, a tributary of the Don, and used it to assist his southern expansion. The forests provided timber for the construction of these ships. To-day timber is carried down the Volga from the north, so that near the river one may see timber houses in the midst of treeless steppe.

In the south of European Russia the steppe between the Dniester and the Don received the name of "Ukraine," which means "on the frontier," or "on the border." Towards the west of the East European Plain the low, marshy lands of Byelorussia also formed a frontier zone, where the Russians struggled for long against the Polish, Lithuanian, and other states. Thus to-day the peoples of the Ukraine and Byelorussia have languages and traditions rather different from those of the Russians.

In the twelfth century the Teutonic Knights began to establish trading posts around the Baltic, and later trade in the North Sea and the Baltic came under the control of the Hanseatic League. The Volga became an important trade route between the Baltic and the Caspian Seas. Caravans from India and China came down to the shores of the Caspian, and silks and spices were loaded on to boats for the journey up the Volga and then by portages along the rivers and lakes giving access to the Gulf of Finland.

Novgorod, situated on the Dnieper-Baltic route from the Black Sea, extended its domain over the portages from the Volga, and was for long the middleman between the Baltic and the East. At various points along the Volga, controlled by the princes who were the overlords of the nomadic peoples, Greeks, Mongols, Tartars, Slavs, and Indians came to trade.

During the twelfth century, however, two small Slav principalities grew up, with their centres at Rostov and Suzdal, between the Volga and its tributary, the Oka. Suzdal is a small town on the left bank tributary of the middle Klyazma, which joins the Oka west of Gorki. The town gave its name to the land of Suzdal, described by Kropotkin as "Russia's Ile de France." A few miles from Suzdal, between the latter town and the ancient town of Rostov in the north, and Murom, on the Oka, in the south, is the town of Vladimir, also founded in the twelfth century. Prince Andrew of Bogolyuby (1174), transferred his capital from Suzdal to Vladimir, ruled over the lands of Suzdal, Vladimir, and Rostov, and thus obtained control of the portages between the Volga and the rivers leading to Lake Ladoga, and so to the Gulf of Finland. In 1169 Andrew's army took Kiev, and by the thirteenth century Kiev's supremacy had definitely given way to that of Vladimir.

The Volga and its tributaries rise on the margins of the low morainic hills from which flow the other important rivers of the East European Plain. Hence the principality which controlled the land of Suzdal controlled all the trade between the Baltic, the Caspian Sea, and the Black Sea. As the power of the principality increased its domains were extended.

To the west of the land of Suzdal lay the township of Novgorod, which came largely under the control of Vladimir during the thirteenth century. Like Pskov, Novgorod was a middleman between the Baltic and Northern Eurasia, protected to the east by marshes from the invasions of the Mongol Tartars who swept across the Russian Plain during the thirteenth century.

To the east, at the junction of the Oka and the Volga, Nizhni Novgorod became a great market centre for exchange between East and West, lying not only close to the point where the Volga turns south to the Caspian, but also near its junction with the Kama, a great navigable tributary, providing a waterway from the Urals and Siberia.

By the fourteenth century a more powerful principality had become established between the Volga and the Oka. This was Moscow, situated upon the river Moskva, a tributary

of the Oka. Very soon the lands of the Moscow State had extended to control the heads of the waterways giving access to the four seas around the East European Plain, and no trader could send goods from one part of the Plain to another, or from one sea to another, without passing through the lands of this small state. The countryside was well covered with forests and marsh which offered protection from invasion by neighbouring tribes.

The Muscovites gradually extended their control, pushing into the wooded steppe and steppe regions along the wooded valleys. But before Moscow had established her supremacy the whole of the Russian lands were invaded and plundered by powerful nomadic forces originating in Mongolia, and the rise of Moscow, between the thirteenth and fifteenth centuries, was largely the result of her ability to free the domains under her control from the Tartar yoke.

THE GOLDEN HORDE

The melting snows of the mountains which border upon Iran and Afghanistan feed numerous streams which unite to form rivers flowing across the arid plains at the foot of the hills. The Asiatic peoples who lived in these valleys irrigated their fields with the water from the rivers, and produced a great variety of crops. In the tenth century Central Asia was overrun by the Mongols, who established control over these lands, making them the centre of one of the four major divisions of their empire. Many of the fertile lands were laid waste, and the cultivated fields turned into pasture. But along the mountain borders there were towns where merchants and traders came from China, India, Mesopotamia, and Europe to exchange their goods. To the north, extending from the Altai to the lower Volga, was another section of the empire, known as Kipchik, or the "Golden Horde," and ruled by the Mongol Prince Batu. His people were the nomadic tribes of the steppe, used to moving about over great distances. They were fine horsemen, and during the thirteenth century swept on from south-western Asia along the open steppe-land

belt across the whole of the Russian Plain. They invaded the deciduous forest lands as well as the steppe, and eventually controlled a large portion of what is to-day the Soviet Union. Never seeking a settled way of life, these Mongols were bent on securing wealth for themselves, so that they were aptly named the "Golden Horde." A Russian writer of the time tells us that "they burn the villages, the farmyards, and the churches. The land is turned by them into a desert, and the overgrown fields become the lairs of wild beasts." Mongol rule continued in effect until the middle of the fifteenth century, isolating Russia from the rest of Europe. It was only when that rule had been finally abolished that the Russian lands were able to emerge as a united nation-state, and once more establish contact with the world outside the frontiers.

THE RISE OF THE MOSCOW STATE

As the power of the Mongols decreased that of Moscow increased. The Mongol Tartars did not occupy the conquered lands in order to undertake their economic organization, but sought only tribute—material wealth for themselves. They eventually allowed Russian princes to collect the tribute and even allowed them forces to assist them in their task. These powers were granted to the Grand Duchy of Moscow in 1328. Moscow, situated at the crossroads of the water-transport system, was centrally placed to unite the other Slav principalities, and was well protected by surrounding forests and marshes.

By the fifteenth century Moscow was able to assert its independence of the declining Mongol Empire. The forces of Tartar cavalry obtained for the collecting of tribute greatly assisted in the domination and annexation of neighbouring principalities, particularly the powerful principality of Novgorod in the west (annexed in 1478), and against Lithuanian expansion into Western Russia. Dr Vaughan Cornish (in his work *The Great Capitals*) points out that at this time Russia's chief foreign frontier was against Lithuania—i.e., between the Volga and the Oka. Moscow lay half-way between the two

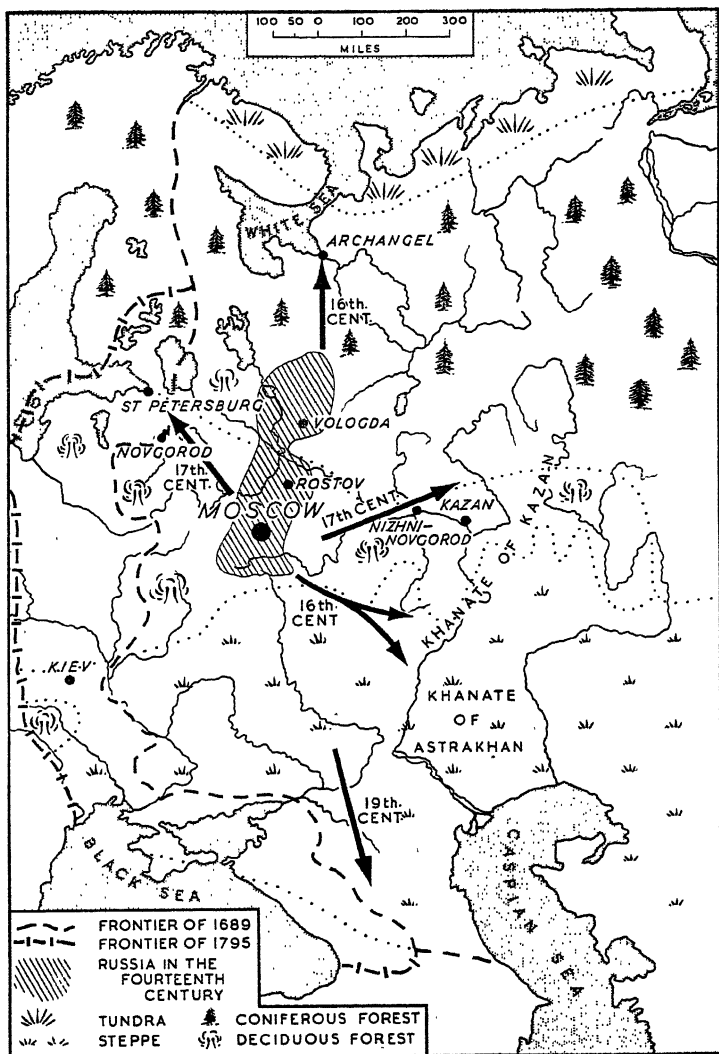


FIG. 16. THE GROWTH OF THE RUSSIAN STATE

rivers, on elevated and relatively dry morainic land, while between the rivers there ran the important dry-land watershed trading route, raised above the surrounding marshes, and running from east and west—from Nizhni Novgorod, through Smolensk, to Vilna and Warsaw.

There was also the water-route, with portages from the tributaries of the Upper Volga to the West Dvina and the Dnieper, the Lovat river, and the Gulf of Finland. Thus Moscow lay between important route ways from the west to the great trade nexus of Nizhni Novgorod—"a common junction of the home communications with those leading across the principal defensive frontier" (Vaughan Cornish). As stated above, that frontier was between Russia and Lithuania, the rising political power in the west. At the beginning of the sixteenth century Moscow annexed a considerable portion of South-western European Russia from Lithuania, which at the height of its power extended to Odessa and the Black Sea.

Gradually most of the Slav communities were absorbed by the Moscow State. As the trade route from the East to the Baltic, by way of the Volga, became of greater importance the Moscow princes drew increased wealth from dues levied upon the cargoes of silks, spices, etc., which came up from the Caspian Sea. The Moscow merchants themselves began to trade. To obtain furs for this purpose, they sent their trappers and traders to the north for furs, adding these coniferous-forest lands to the Moscow State. At the end of the sixteenth century they continued eastward, following the Vichегда river, making a short portage to the Pechora, continuing along its tributary, the Usa, and making another portage to a tributary of the Ob. Along the Ob and its tributaries they were able to penetrate into Western Siberia.

This was a very roundabout way of getting into Western Siberia, but the southern and more direct route was avoided since it was open to attack from the nomadic tribes of the steppe until the Tartars had been subdued and a route established along the wooded steppe zone.

Ultimately extending across Western Siberia, Moscow was

able to secure an immense area of agricultural land, a food-base unapproachable from the north, and far removed from the western frontier. (It is interesting to compare the great value to Russia of the recently developed agricultural and industrial bases of Siberia in the present war.)

However, Russia had to consolidate her position in the west before she could commence to conquer the more distant lands to the east, and the next movement of the Slavs was down the valley of the Volga. Between the middle Volga and the Caspian Sea lived Tartar peoples, under the rule of the Khans of Kazan and Astrakhan. Their lands were seized, as well as the lands of the middle Don, during the sixteenth century, thus opening the way towards the Black Sea and the Caspian.

In the sixteenth century Prince Ivan of Moscow, or Ivan the Terrible, as he was popularly called, was able to proclaim himself "Tsar of all the Russias." The Moscow principality had extended along the rivers, to north and to south, over coniferous forest lands and steppe, and now formed the centre of the new Russian State. The Tartar yoke had been finally broken, and the unity of the Russian principalities achieved. Russia now emerged as a definite nation-state. Eventually Russian serfs were driven to the rich black earth lands in the south to farm them and sow wheat.¹ The steppe became the granary of Russia, and the Volga was the highway along which the grain was carried from the south to the north. The Volga, an early trade route and highway for grain transport, became a vital factor in the geography of Russia.

The importance of the Volga in Russian history is reflected in the songs and folklore of the country. Many are the songs and stories about this great river, which have been handed down from generation to generation. "Mother Moscow" and

¹ Tartar invasions of the Ukraine during the thirteenth century compelled large numbers of Ukrainians to flee into Central Russia, where the inauguration of the system of large-scale private ownership of land during the fourteenth and fifteenth centuries rapidly reduced the peasants to serfdom. Many serfs escaped to the 'freelands' of the south and east and founded independent Cossack communities in the Dnieper, Don, Ural, and Siberian valleys.

"Mother Volga" are expressions frequently occurring in Russian literature and history.

The central position of Moscow was the most important factor in the growth of its power. The towns of the Moscow State became markets to which came merchants from Western Europe and the East. Greeks mingled with Tartars and Bulgars. In the bazaars wares were sold which had come from India, China, and Mongolia.

Moscow remained, and has remained until the present day, the centre of communications for the whole country. Even a hundred years ago trade along the Volga was of great proportions. Writers who describe the towns along the river in 1850, for example, mention Rybinsk, where, during the summer, hundreds of boats came to transfer their cargoes to barges for transport along the upper reaches of the river and the canals which had been built connecting the Volga with Lake Onega. In early times the sites of these canals were used as short portage-routes along the morainic valleys.

Portages could also be made to the tributaries of the river Volkhov, which flows northward for 120 miles from Lake Ilmen to Lake Ladoga. From Lake Ladoga to the Gulf of Finland the river Neva flows over a distance of only 36 miles. But it is not a small river. In places its width is nearly a mile, while its volume is greater than that of the Rhine.

In the sixteenth century, after Chancellor's adventurous journey to Moscow, trade commenced with England. Grain was carried along the Volga to the north. Flax, oats, and hemp came from the farms of the deciduous forest lands, while the northern forests supplied timber, furs, resin, and honey. But how to export them? The shores of the Black Sea and the Gulf of Finland were as yet not in Russian hands. The towns of the Hanseatic League had controlled the Baltic coast since the fourteenth century. The port of Archangel, a settlement founded in the tenth century, was chosen, and the river valleys from the tributaries of the Volga to the North Dvina provided the trade route. The town of Vologda became an important station on this route.

Russia was now not only a state. She had established contact with the world outside through her first port.

During all these years Kiev, situated at the edge of the deciduous forest zone, was constantly attacked by the nomads of the steppe. The town was also on the open Russian Plain where it continues into Western Europe. It lay open to attack from the west, and was sacked and burned many times. It was in Polish hands until the seventeenth century. Poland had united with Lithuania in 1569. Between 1610 and 1612 the Poles occupied Moscow, and from 1654 to 1681 there were wars between the Moscow State, Poland, and Turkey for the possession of the Ukraine. The Eastern Ukraine was ceded by Poland in 1667. It was not until the latter half of the eighteenth century that the whole of the Ukraine became part of the Russian State and added to it more fertile wheat-lands.

The peasants who had fled from the serfdom of Central Russia to establish free Cossack settlements in the Ukraine were again brought under the system of serfdom. Many Cossacks hired themselves to the Tsar and were used as a sort of frontier guard in the struggle against the Tartars in the south-east.

Cossack bands were also employed in the conquest of Siberia. These descendants of the freedom-loving men who had escaped the tyranny of serfdom were granted special privileges and became the vanguard of those forces which introduced the tyranny of Tsarist rule throughout two continents.

During the seventeenth century the peoples of the steppe towards the east were more and more harassed by the Russians, who moved across Siberia along the open plains of the wooded steppe zone, travelling along the great Siberian rivers, the Yenessei, the Lena, the Amur, and their tributaries, and making portages from one to another. Their progress was not interrupted by any natural barrier, and there was little opposition from the small native population. A fortress was established at Tomsk in 1618, and at Kuznetsk and Yenesseisk in 1619. They met no strong opposition until they

came into contact with the Buryats, west of Lake Baikal, so that, rather than continue up the upper Tunguska and Angara rivers, they were forced to follow the valley of the upper Yenessei, and here their progress was halted for some time. The Buryats stirred up the Evenki tribes to attack the Russians. The forts of Krasnoyarsk and Yenesseisk became bases for the struggle against the Buryats and Evenki. Only with great difficulty was it eventually possible to penetrate eastward along the Angara valley, subdue the country to the east of Lake Baikal, and establish forts along the river Selenga, a tributary of the Amur and the key to the route to the Pacific.

In 1638 the first consignments of tea were imported from China. In 1639 the first fur-traders reached the Pacific. In 1643 Cossacks came to Lake Baikal.

Traders travelled eastward from the North Dvina and Pechora. The whole of Siberia was traversed, and the Behring Strait reached, in 1656. Eventually the portages between the rivers became regular trading routes. Many of the old Siberian towns—Tobolsk, Omsk, and Yakutsk—were originally fortified trading posts on these routes. In the first place the Russians were most interested in the furs and gold found in the forests. Later the steppe lands to the south were colonized and became another source of wheat and agricultural produce.

THE OUTLETS TO THE FOUR SEAS

By the end of the seventeenth century most of the Russian Plain was Russian, and the native peoples had been subdued. But Russia was still largely cut off from the world outside, for the Swedes controlled the lands around the Gulf of Finland, and the Turks controlled the shores of the Black Sea. Alexei Tolstoi, in his novel *Peter the Great*, gives an excellent account of the isolated position of Russia during this period. He writes:

You could not sell to your own folk—they were too poor. Wares could not be taken abroad—there was no seaport. All foreign trade was in the hands of foreigners. It was maddening to learn

how people traded in other lands. Things in Russia were wretched. Why was Russia accursed? When was she to move forward?

Archangel was Russia's only port at this time, and was ice-bound during the winter. Ice-free ports were essential for foreign trade. The vital sea-outlets were seized during the eighteenth century by Peter the Great (1689-1725). Novgorod had been controlled by the merchants of the Hanseatic League until the fifteenth century, and then had been compelled to submit to Moscow.

Peter the Great not only made war against the Swedes, and obtained control of the Baltic lands of Estonia and Northern Latvia, but determined to make up for Russia's lack of contact with the outside world in the past, and opened his "window on the west" in 1703, by building St Petersburg on the marshy Neva Delta, where no town had ever before existed. Not content with this, he transferred the capital from Moscow. Just as the Varangians, and later the Hanseatic League, had used Novgorod as the centre of trade with the West, so now did Peter the Great intend St Petersburg to be used. Commanding the sea-outlet of the route along the Dnieper and Volkhov, as well as the route from the Upper Volga, it was established as "Novgorod moved to the mouth of the Neva." Many historians regard Novgorod as the centre of the first Russian State, Kiev as the second, and Moscow as the third, eventually absorbing the others. The opening of the port of St Petersburg, later renamed Leningrad, marked the beginning of the phase of the development of Russia from the Leningrad-Kiev-Moscow triangle over the whole of the West Russian Plain. The main defensive frontier was now moved to the west, and St Petersburg became the eastern terminal of ocean communications with the West, while Moscow remained the western terminus of land communications with the East. Almost all that came to be known as European Russia was secured, and the process was completed with the establishment of control over all the four seas, when territory adjoining the shores of the Black Sea was seized during the reign of Catherine II (1762-96) and the right to send ships through the Black Sea to the Mediterranean

was obtained. The Baltic lands were further enlarged by the addition of Lithuania and Southern Latvia. It now remained to secure the borderlands on the west, and while defending the west, secure the lands to the south and east.

THE ESTABLISHMENT OF THE RUSSIAN FRONTIERS

The western border has always been the most difficult for Russia to defend. There is no natural barrier of any importance. The Kiev principality suffered on account of this. There was an almost constant state of war with the Poles throughout the seventeenth century. The German invasion of 1941 was not the first with which the Russians had had to contend. Under Catherine II, however, Russia extended her domains far to the west. Estonia, Latvia, Lithuania, Western Ukraine, and Western Byelorussia were drawn into the Russian State.

In the next century Finland was added, being ceded by Sweden in 1809, and Bessarabia, ceded by Rumania later in the century. Poland was annexed as an autonomous kingdom in 1815, after the failure of Napoleon's invasion of Russia.

All these territories formed the western frontier zone of Russia until they were separated again after the Great War of 1914-18. The Baltic States, Western Byelorussia, the Western Ukraine, Bessarabia, and part of Finland returned to the Soviet Union between September 1939 and August 1940 (see Figs. 57, 58).

The Russian Plain, therefore, not only created favourable conditions for the relatively easy expansion of the Russian State, but also created difficulties in the establishment of a stable western frontier.¹ The present frontier with Poland corresponds closely to the ethnographic division—between the Poles on the one hand, and the Ukrainian and White

¹ " . . . the secular struggle between Russia and Poland for a natural frontier is the unmistakable counterpart in history of the vagueness of the boundary between Russia and Europe."—D. S. MIRSKEY, *Russia: A Social History* (Cresset Press).

Russian peoples on the other—rather than with any definite physical feature.

Elsewhere, around the edges of the plain, there were definite natural frontiers—the Arctic Ocean in the north, the Carpathians, Caucasus, and Pamirs in the south, and the great thinly populated, arid, and semi-desert areas of Sinkiang and Mongolia in the south-east and east.

In the first half of the nineteenth century the Caucasian lands were seized. The high mountains of the Caucasus divide the many valleys from one another, so that the peoples remained for centuries disunited, one tribe often fighting against another. It was not difficult for the Russians to conquer these peoples by means of a system of fortified posts and mountain-roads.

Immediately after the conquest of the Caucasus the Asiatic lands lying to the east of the Caspian were taken. By 1895 the Tsarist Empire had extended to the frontiers of Persia and Afghanistan. We have already noted that Asiatic Russia is an arid region, far inland, far away from oceanic influences. For this reason the climate is extreme, with Siberian winters and Egyptian summers. A great deal of the country is poor steppe, the home of nomadic peoples such as the Kazakhs. But in the irrigated lands around the rivers rich crops can be grown—apricots, melons, wheat, and cotton. When the Russians took possession the lands were used mainly for the production of wheat and cotton. Central Asia was exploited rather than colonized, and became one of Russia's most lucrative colonial lands.¹

Eastern Siberia is separated from China by mountains, plateaux, and vast stretches of arid territory. The great rivers flow northward through forests, where agriculture is difficult, to the inhospitable Arctic. In the far east of Siberia, along the Pacific coast, climatic factors have played a most decisive rôle. To the rigours of the extremely cold

¹ "Always the conquering armies were followed by traders and tax-collectors. The former openly pillaged the natives. The latter practised legalized banditry."—R. A. DAVIES and A. J. STEIGER, *Soviet Asia* (Gollancz, 1943).

Siberian winter are added the cool, damp, raw conditions of summer, producing a climate unfavourable both to stock-breeding and to the growth of crops—a climate similar in many respects to the eastern seaboard of Canada.

East of the Stanovoi Range the northern limit of cereals lies farther south than the latitude of London, while at Vladivostock, about as far north of the equator as Marseilles, the sea is frozen for four months each year.

All these factors contributed to the isolation of Siberia, and to the fact that it was colonized from the west, by the Russians, rather than from the south-east, by the Chinese.

Although the Russians reached the Pacific coast during the seventeenth century and commenced to trade with China along a route from Peking, through Mongolia, to Irkutsk, the frontiers between China and Russia were not finally established until more than 200 years later. The first treaty to be signed between China and a foreign Power (the Treaty of Nerchinsk) was concluded with Russia in 1689, leaving the Manchu-Chinese Empire in possession of land on both sides of the Amur, the Russian boundary following the Stanovoi Range and the Uda river.

In 1854 another treaty with China gave to Russia all the country north of the Amur and east of the Ussuri, as far south as the Korean border. The Pacific port of Vladivostock was founded in 1860. In 1875 Japan ceded Sakhalin in exchange for the Kurile Isles.

Although Siberia had for long been of value as a source of furs and gold, after the construction of the Trans-Siberian Railway along the southern borders (between 1891 and 1901) it became the home of thousands of colonists from European Russia. Agriculture is possible in the valleys and basins of the south. New mines and industries were established near the railway, although only on a relatively small scale, as no serious competition with the old industrial centres of St Petersburg and Moscow was permitted. The railway provided a means of export for lumber and agricultural and industrial products. Emigration, which had commenced in the second half of the nineteenth century, increased in volume, and a

belt of Russian settlements was established, extending 3500 miles from Omsk to Vladivostock.

In 1896 Russia obtained the contract to construct the Chinese Eastern Railway,¹ and the right to police the land along which it ran. Similar rights were obtained in 1898 on the branch line from Harbin and Port Arthur, so that in effect long ribbons of Russian territory penetrated into Manchuria, and the Imperial Government paid more attention to the prospects of expansion towards the south than to the far eastern territory of Siberia.

After the Russo-Japanese war of 1904-5 Japan was left in control of Korea (finally annexed in 1910), half of Sakhalin—later found to be the portion without oil deposits—and Port Arthur.

Thus Russia completed the process of expansion over the entire Russian Plain, to those natural frontiers which formed the limit of the Tsarist Empire in 1917. Actually that expansion had continued somewhat farther to the east, across the Behring Strait into North America! Alaska was a Russian possession from the eighteenth century until it was sold to the United States in 1867, for 7,200,000 dollars.

The map of the U.S.S.R. and the development of the Russian State from the Leningrad-Kiev-Moscow triangle where the first Slav communities established their clearings and commenced farming in the deciduous forests, makes it clear that Moscow was well placed to control the waterways radiating from the low morainic hills to the four seas. Along these river-ways the Slavs expanded over the Russian Plain, taking the coniferous forest lands of the north and the steppe lands of the south and east, finally reaching the four seas at the edges of the West Russian Plain, and securing outlets for trade with the rest of the world.

Along the rivers, transport, trade, and communications were developed from one part of the plain to another, and to

¹ The C. E. R. was sold to the Japanese puppet state of Manchukuo in 1935, leaving the U.S.S.R. with the northern line of the T.S.R. running to Vladivostock entirely within Soviet territory.

each of the four seas. The northern forests provided timber, gold, and furs, the steppe lands provided wheat and cattle. From the East European Plain the routes of the traders and explorers followed the tributaries of the Siberian rivers, and colonists moved into Siberia along the great steppe zone. Finally, the highlands which marked the frontiers in the south and east were reached.

As we trace out this development from early times, from the tiny Moscow State, we can see how true is the statement made by Kropotkin, the Russian author, that this was "Russia's Ile de France."

CHAPTER VI

Nationalities and Administrative Divisions

ORIGINS OF RACIAL AND NATIONAL GROUPS

IN Pleistocene times groups of primeval man moved out northward from their original home in the south-western corner of Asia and fanned out in three directions, eventually becoming concentrated in three main areas, approximating to the homes of the Mongol, Turkic, and Caspian racial groups, which in time matured into the Mongol, Alpine, and Nordic types. The Alpine type spread over the lands which became the home of the Slavs (a linguistic, not a racial, group)—and it is probable that there was some admixture of Nordic stock.¹ But throughout the far north of the Soviet Union, and in the lands to the east of the Volga, the native peoples are characterized by straight hair (usually black), yellow-white, yellow-brown, or yellow-red skins, and, with the exception of the Eskimos, mesocephalic or brachycephalic head-form.

These peoples are of Turkic or Mongol origin. The Turkic and Mongol groups spread northward over Asia in very early times, and reached the Arctic shores as far west as Finland. As subsequent waves of these peoples spread out from the southern steppe lands the original groups tended to be pushed more and more towards the margins of the continent, farther and farther into the inhospitable lands of the north.

The Yukagirs, Chukchis, Koryaks, Kamchadalists, Giliaks, and Eskimos of the north-eastern parts of Siberia (Fig. 17) and the misnamed "Yenessei Ostyaks" of the middle Yenessei are all Palæo-Asiatic remnants of ancient peoples. They

¹ Some authorities regard the Ukrainians as the original Slav or Russian stock. They may have spread out to the north and mixed with peoples of Finnish origin. In the Ukraine there has been more mixture with Turkic peoples—the result of the Tartar invasions (see *The Ukraine and its Peoples*, by H. P. Vowles).

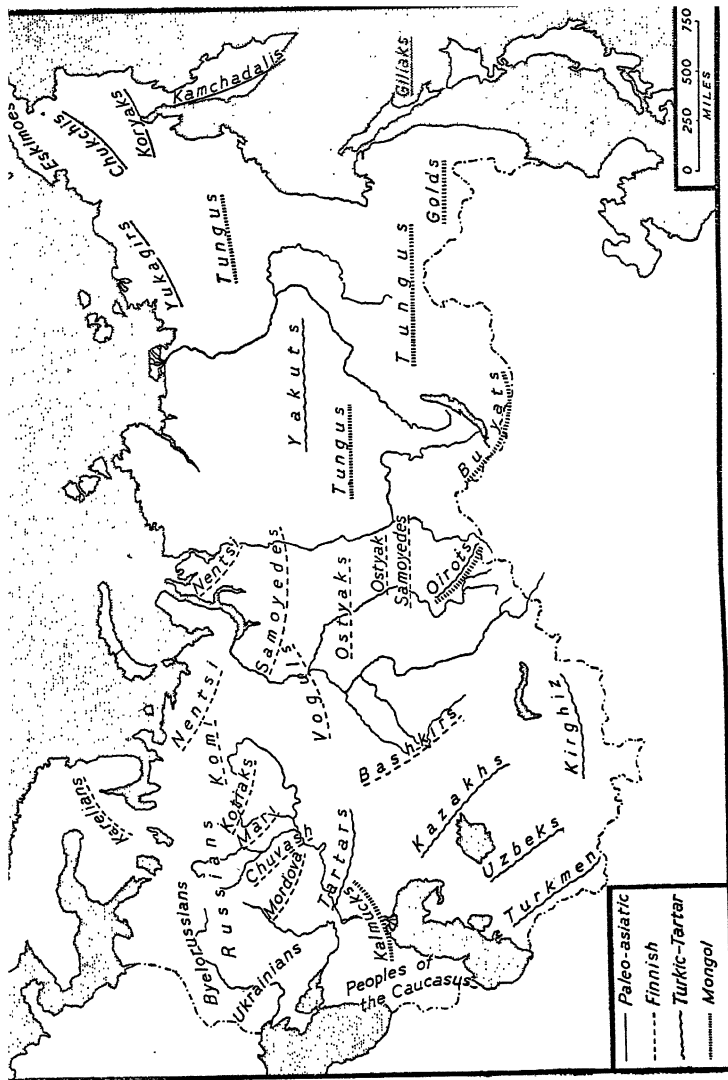
vary both in language and appearance, although they are all straight-haired, with yellowish skins.

In the western part of the Far North there are peoples of Finnish origin. The Finnish groups probably represent the remains of an ancient migration of peoples from the Altai, across the Urals into the north of the East European Plain, where they mixed to some extent with Nordic stock. Such groups are the present-day Komi, Karelians, Voguls, and Ostyaks. Their hair is black or dark brown, the skin varying from white to yellow-brown, the cheek-bones are prominent, and the nose straight or concave. They are of medium stature.

Occupying territory lying roughly between that of the Palæo-Asiatic groups and the groups of Finnish origin are the peoples commonly known in the past as the Samoyedes, although now more correctly named Nentsi and Ostyak Samoyedes. (It must be remembered that in the past traders often gave these tribes names which were really terms of abuse or derision, and that only within recent years have their correct national names been restored to them.) These peoples seem to have spread northward from the Altai, along the Ob and the Yenesei, and then to have fanned out along the shores of the Arctic Ocean, extending to the west as far as the White Sea. They became mixed with the Ostyaks and Voguls of Finnish origin, and probably also with the Yenesei Ostyaks. Hence they are often regarded as a Finnish group.

The Ostyaks are characterized by their medium to short head-form, straight black hair, sallow skin, broad, flat face and nose, oblique and narrow eyes. They are usually of short stature, and rather stout and muscular in appearance.

Mongol and Turkic-Tartar peoples spread northward from the steppe and partly subdued the inhabitants of the northern lands. The Turkic group is represented to-day by the Yakuts. Like the peoples described above, they too were compelled to move into the forest lands by the pressure of other nomadic steppe tribes. They are remarkable, however, for the fact that they have adapted themselves to their new environment more successfully than any other group which originated in



the steppe. They breed deer, rear cattle, grow crops, hunt, and fish, and have extended agriculture northward to a surprising degree.

They spread into their present territory along the Angara valley, and their language, which is of Turkic origin, has become the 'commercial language' of Eastern Siberia. The Yakuts are gay and vivacious people, and have always been the dominant tribe in the trade and transport of this part of Siberia; they have been aptly named the "Frenchmen of the North."

After the Yakuts came the Tungus people, Mongol stock from Manchuria, speaking a Tartar language. To-day they are called by their correct national name, the Evenki. Not only do they occupy the lands to the east and west of Yakutia, from the Yenesei to the Sea of Okhotsk, but they have also extended into the Amur and Ussuri basins, where they are represented to-day by the Orotchi, Golds, and Lamuts. While many of the Yakuts have adopted a sedentary mode of life the Evenki have remained, to a great extent, nomadic hunters and fishers.

Around the southern end of Lake Baikal, especially in the small steppe regions, are the Buryats, who have been described as the most pure Mongol stock of Siberia. Their hair is black, coarse, and straight, their skin yellow or yellow-brown. The head is broad, and the face broad and flat, with dark brown eyes, and the Mongolian eyelid. Frequently, however, the eyes are not oblique, but straight. The bridge of the nose is low, and the nose itself insignificant, with broad nostrils.

Before the development of Buryat Mongolia, which has transformed the country during the past twenty-five years, the Buryats lived in tents made from felt or skins during the summer, while in winter they built a sort of wigwam from wood. During the conquest of Siberia the Russians were compelled to meet their resistance by setting up a chain of fortified posts—at Irkutsk, Nerchinsk, Verkhny-udinsk, etc.—but since their incorporation within the Soviet Union many of these people have copied Russian agricultural methods and adopted a settled mode of life. Others are still nomads,

moving over the steppe with their herds and flocks, and migrating to the mountain pastures during the summer.

Finally, both the Turkic, or Tartar, and the Mongol peoples moved westward across the steppe along the great grassland gateway into Europe. Wave after wave of these nomadic groups, at different times, and under different names, swept across the plains.¹

Because of their nomadic way of life these branches of what is sometimes named the 'Altaian family' spread out along the grassland plains over vast areas of Europe and Asia. To-day the Turkic branch is represented on the shores of the Mediterranean in Turkey, and on the shores of the Arctic in the Yakut Republic, while the Tungus peoples inhabit the Pacific shores around the Sea of Okhotsk. It should be remembered, however, that outside Turkey and the republics of Soviet Central Asia the total number of these people is small. Many of the peoples of Finnish origin, and the Samoyeds from the Altai, were conquered and assimilated by the Tartars, who extended their domain as far north as the Tobolsk district in Western Siberia, and far into the European part of Russia. Near the mountains; in the south of Western Siberia, Mongol and Tartar stocks have been considerably mixed, as in the case of the Oirots and Kalmucks, for example. Farther south the Asiatic republics are inhabited by peoples of Turkic-Tartar origin.

In the East European Plain both Mongols and Tartars established themselves in European Russia. When eventually they had been conquered by the Russians and "fixed to the soil," or when they themselves adopted a sedentary way of life, they remained as 'islands' of Tartars or Mongols. Thus the Tartars of the Volga formed the State of Kazan, changed their nomadic form of life, and settled. They are also to be found in the lower Volga and in the Crimea. The Kirghiz, another group, advanced as far as the Urals and the Volga, and eventually established themselves in the dry steppe and

¹ The present distribution of national groups in the U.S.S.R. clearly reflects the profound influence of the structure of the country. Movement across the vast plains, especially in the south, was easy. Hence cultural and racial influences of many kinds have made themselves felt.

semi-desert regions between the shores of the Caspian and the Tian Shan Mountains.

The Kalmucks, on the other hand, are of Mongolian origin, and made the last Asiatic invasion of the East European Plain. They were subdued by the Russians in the seventeenth century, and most of them retreated into Asia. To-day only small groups remain near the Volga.

The Tartar people, however, have not usually remained as either pure ethnic or pure linguistic groups. Finnish tribes, such as the Finns and Karelians of Karelia, and the Esths, are well known. But the descendants of Finnish tribes can still be found in the Novgorod, Tver, and Perm districts, as well as between the Vyatka and Kama rivers (the Votiaks) and among the Komi and Nentsi described above. They also extended southward along the Volga, where they came into contact with the Tartars. The Marii and Mordovians are of Finnish origin. But in several cases they have been assimilated by the Tartar invaders. Votiaks and Marii, for example, are found among the Bulgars of the Volga. The Chuvash are believed to be of Finnish origin, although they have adopted a Turkic language. The Bashkirs are of similar origin, but have been considerably mixed with the Tartars.

An interesting community which has no connexion with either Slavs, Finns, or Tartars is that of the Volga Germans, who fled from religious persecution in their homeland and emigrated to the Volga during the reign of Catherine the Great (1762-96).

In the Caucasus there is a large number of different national groups, each with its own language and traditions. Their origin varies. There are Turkic and Alpo-Carpathian elements, and some groups with very obscure origin. Each group, cut off from the other by mountains, has developed a very strong national consciousness, which was reflected in the past in the continual strife and wars of the Caucasian peoples.¹ This continued until the Soviet Government gave

¹ See Chapter XVI. W. E. D. Allen gives a brief summary of the ethnology of the Caucasus in his article "The Caucasian Borderland" (*Geographical Journal*, vol. xcix, Nos. 5, 6 (May-June 1942)).

each group national autonomy within the present system of Caucasian Republics.

The influence of the ancient Greek Empire is noticeable near to the shores of the Black Sea. There are considerable Greek elements among the population of the Melitopol and Odessa districts.

To add to the complexity of the distribution of national groups in the U.S.S.R., wherever Russian expansion and colonization has taken place there has been mixture of Slav and native stock.

To-day peoples of Slav origin represent more than 75 per cent. of the total population. The Turkic peoples represent the second important group, but they only amount to 4 per cent. of the entire population of the U.S.S.R.

The historical development of the Russian State is reflected in the present distribution of the population, the arrangement of administrative divisions, and the types of cities and villages. The most dense areas of population are to be found in the central and southern parts of the East European Plain—in the main industrial areas—and in the rich black earth lands. The importance of the waterways and the portages is reflected in the number of towns situated on the rivers or at points controlling the portages or bridgeheads—Moscow, Vyatka, Vologda, Kuibishev, etc. The concentration of towns and villages of the north-west upon the morainic hills has already been mentioned. In the south the Russians penetrated along the river-valleys into the steppe. The importance of the rivers as sources of water in these dry lands is shown by the present concentration of settlements close to rivers and streams and places where wells could be sunk.¹ The necessity to build towns as fortified points in elevated positions on the plain is obvious everywhere. Moscow, Tula, and Ryazan each possesses its *Kreml*, or ancient fortified centre, the fort, arsenal, and sanctuary of the town. Rostov, Vladimir, Gorki,

¹ There are practically no single scattered farmsteads in the north, and few in the south. The desire for protection against invasion, wild animals, and the weather caused people to congregate in villages in the north. In the south, water-supply tends to control settlement.

and Kazan also possess such ancient fortified centres, known as *Detinetzi*. The plan of many of the towns often shows their growth from the original fortified strong point. As the town expanded a new circle of ramparts was constructed, and these remain to-day as circular boulevards or roads, intersected by other roads which radiate like the spokes of a wheel from the centre.

THE PRESENT DISTRIBUTION OF NATIONALITIES

To-day there are over 150 different languages spoken in the U.S.S.R., and there are at least forty national groups with populations greater than 20,000.

The Russians number approximately 100,000,000, a little more than half the total population of the whole of the Soviet Union. The Ukrainians provide the next largest group, with a population of about 40,000,000. Thus it will be clear that the other national minorities are much smaller. In Russia before 1917 these small native populations were regarded as 'backward peoples,' mainly useful in supplying cheap labour. These peoples were not recognized as national groups. All official business had to be conducted in the Russian language. A man might be tried and imprisoned by a Russian court without having any idea of what had been said during the proceedings. In addition to this, practically no industry was allowed to grow up in these 'backward regions.' Raw material, such as cotton, was taken to European Russia for manufacture, or was exported.

In 1917 the Soviet Government proclaimed the right of each nationality to live on an equal footing with all the others. Since that date each national minority has been given its own territory, while the people have received local autonomy—that is, the right to govern their own affairs—to a degree corresponding with the size and ability of each national group. The planning of the country as a whole, and matters which concern the well-being of the whole of the U.S.S.R., are discussed by the Supreme Soviet, the governing body of the whole of the U.S.S.R. in Moscow, to which each part of the Soviet Union sends its representatives.

Although economic regions often cut across national boundaries, as far as is possible the national territory of each of the different peoples has been arranged to include land of industrial and agricultural value, and the people are encouraged to develop their agriculture and build up their industries. The advances in agriculture and industry among these national minorities have greatly contributed to the increase in the wealth of the U.S.S.R. as a whole.

The map of the administrative divisions of the U.S.S.R. (Fig. 18) shows how the territories of the different nationalities have been arranged.

Within the Union of Soviet Socialist Republics there are sixteen national republics, known as Union Republics (the official title is "Soviet Socialist Republic"—S.S.R.). There are the Karelo-Finnish, Estonian, Latvian, Lithuanian, Byelorussian, Moldavian, and Ukrainian republics along the western frontier of the Soviet Union, the republics of Georgia, Azerbaijan, and Armenia in the Caucasus, and the Kazakh, Turkmen, Uzbek, Tadjik, and Kirghiz republics in the Asiatic part of the U.S.S.R. Finally there is the R.S.F.S.R.—the Russian Soviet Federated Socialist Republic—the largest of all the republics of the Soviet Union.

Each of these republics has its own constitution, and enjoys equality with the others. It should be noted, however, that they all have frontiers with foreign states, fifteen of them lying along the borders of the Soviet Union. Since each republic, by virtue of the Constitution of the U.S.S.R., possesses the right to secede from the Union, it would obviously not be practical to form such a republic within the main mass of Soviet territory, since secession would entail the setting up of a foreign state within the U.S.S.R. This is one of the reasons why the territory of certain nationalities consists of Autonomous Soviet Socialist Republics (A.S.S.R.) and not Union Republics.

Within many of the Union Republics there are areas where there is a concentration of people of another nationality, and in such cases Autonomous Republics or Autonomous Provinces have been formed. In 1939 there were twenty-two

Autonomous Republics and nine Autonomous Provinces. There are forty national groups with populations greater than 50,000, and the fact that they enjoy a considerable degree of self-government is one of the factors which has helped to abolish the 'minorities problem' in the U.S.S.R. Many of the smaller national groups possess a small population, often scattered throughout a large area—in the northern forest Tundras, for example. Formerly they lived in a very primitive and backward manner. Some of these people had never seen a train or a motor-car, and had practically no conception of mechanical things. Their languages had in many cases never been set down in written form, since they possessed no alphabet.

It has been possible to educate these peoples and introduce them to modern ways of life. But the process is slow and cannot be completed in a short time. Although the native people are now entering the professions, assuming responsible positions as Government officials, and taking an active and leading part in the local government of their lands, their Russian neighbours had in the first place to give them a great deal of assistance, especially in such matters as the planning and organizing of agriculture, mining, industry, lumbering, reindeer-breeding, education, social and medical services. That their efforts have not been in vain is illustrated by the large part which the native peoples are now playing in the management of their own affairs. The territories of these small and formerly backward national groups are known as National Regions, each of which has its own governing body, or Soviet. To an ever-increasing extent the native peoples are rising to positions of authority within their own Soviets. To take but one example, the chairman and several of the Soviet of the Evenky National Region are now native Evenkis.

The distribution of the territories of the Union Republics, Autonomous Republics, and National Regions is shown in Fig. 18.

The Union Republics, besides containing large populations, have generally a strong national and cultural tradition and have quickly responded to the possibilities of self-government.

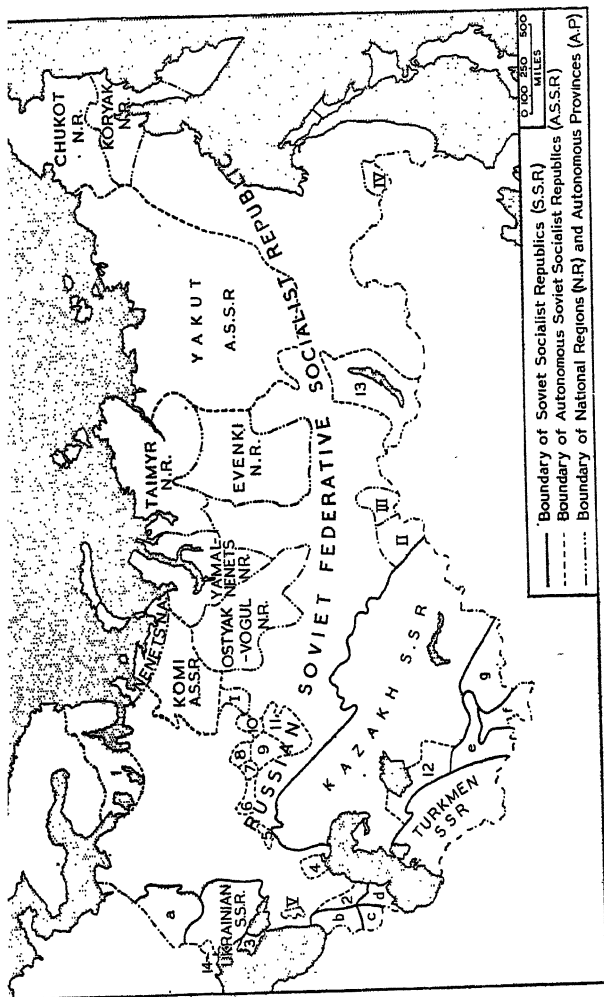


FIG. 18. ADMINISTRATIVE DIVISIONS

- (a) Byelorussian S.S.R.; (b) Georgian S.S.R.; (c) Armenian S.S.R.; (d) Azerbaijan S.S.R.; (e) Uzbek S.S.R.; (f) Tajik S.S.R.; (g) Kirghiz S.S.R. I, Komi-Permyak N.R.; II, Orot N.R.; III, Khakass A.P.; IV, Jewish A.P.; V, Adygei A.P.
- 1, Karlo-Finnish A.S.S.R.; 2, Autonomous Regions of the Caucasus; 3, Crimean A.S.S.R.; 4, Kalmyk A.S.S.R.; 5, Volga German A.S.S.R.; 6, Mordavian A.S.S.R.; 7, Chuvash A.S.S.R.; 8, Marii A.S.S.R.; 9, Tartar A.S.S.R.; 10, Udmurt A.S.S.R.; 11, Bashkir A.S.S.R.; 12, Kara-Kalpak A.S.S.R.; 13, Buryat-Mongolian A.S.S.R.; 14, Moldavian S.S.R.

The National Regions, on the other hand, are sparsely populated, and their peoples were formerly not so highly developed in a cultural or economic sense. Nevertheless, they had their own cultures and traditions, and to-day all that is best in these is being retained, while through their organs of local administration the native peoples are rapidly raising the level of both their culture and economy.

The Autonomous Provinces and Autonomous Republics fall, in the main, between the two types of state organization—the Union Republic and the National Region. Although their peoples are not so numerous as those of the Union Republics, and they did not in the past form such compact cultural and economic units, many of them had some type of government of their own for centuries. Those peoples who are the descendants of the nomadic steppe tribes, for example, had great mobility as horsemen, and their close form of organization gave them superiority over other tribes. They often confined their movements to well-defined areas of the steppe, and fierce battles resulted when the nomads of one tribe took their cattle into the domains of another. Some of them settled and became traders or merchants, buying and selling in the bazaars of the towns. Along the banks of the Volga the people were governed by overlords known as Khans. Most of these groups of people of Tartar-Mongol origin to-day possess their own Autonomous Republics and Provinces—chiefly within the R.S.F.S.R., although there are several within the republics of the Caucasus and Soviet Central Asia.

THE GOVERNMENT OF THE U.S.S.R.

The sixteen Soviet Socialist Republics, with the Autonomous Republics and Provinces, and the National Regions contained within them, together form the U.S.S.R.

The supreme organ of State power for the entire Union is the Supreme Soviet, which is divided into the Soviet of the Union and the Soviet of Nationalities. The Soviet of the Union is elected by direct and secret ballot by citizens of the U.S.S.R. over the age of eighteen years, irrespective of nation-

ality, sex, or religion. For this purpose the country is divided into approximately equal constituencies of 300,000 inhabitants. Each 'constituency' elects one deputy (regardless of nationality).

The Soviet of Nationalities, however, is elected on a *national* basis. In this case the citizens elect twenty-five deputies in each Union Republic, eleven deputies in each Autonomous Republic, five deputies in each Autonomous Province, and one in each National Region.

The division of the Supreme Soviet into the Soviet of the Union and the Soviet of Nationalities ensures that no law can be passed which would be in the interests of the larger national groups at the expense of the smaller. For example, the R.S.F.S.R., the largest of the Union Republics, with a population of about 109 millions, mainly composed of Russians, secures half of the seats in the Soviet of the Union. Legislation must pass through *both* Soviets, and in the Soviet of Nationalities the R.S.F.S.R. is in the same position as any of the other fifteen Union Republics, and holds twenty-five seats. The same number is held by Armenia, a republic with a population of only 1,282,000.

A Presidium is elected which carries on the work between sessions and has the power to dissolve the Supreme Soviet and organize elections. It must call a session of the Supreme Soviet at least twice a year, and its actions and decisions are all subject to the approval of the full session of the former. The Council of People's Commissars is also elected by the Supreme Soviet. It consists of the heads of all the State Departments, and like the Presidium, the actions and decisions of this body must be approved by a full session of the Supreme Soviet.

The Supreme Soviet is responsible for those matters which concern the U.S.S.R. as a whole—defence, the security of the State, and the efficient economic planning and co-ordination of planning of the industry, agriculture, etc., of all the Union Republics (in consultation with the republics concerned). It also must ensure that the basic laws for the whole of the U.S.S.R. are maintained, together with hours of work,

living standards, health, etc. Much of this work comes within the province of the People's Commissars.¹

The system of government described above is followed to a large extent in the Union Republics, each of which has its own elected Supreme Soviet (but no Soviet of Nationalities), Presidium, Council of People's Commissars, and other officials. The government of a Union Republic is responsible for 'home affairs,' such as finance, planning, social services, education, etc., and in the organizing of its economy works in consultation with the Council of People's Commissars of the Union.

Each Autonomous Republic also has its own Supreme Soviet, its own constitution, Presidium, and Council of People's Commissars, although its constitution must be ratified, and the boundaries of its territories defined, by the Union Republic to which it belongs.

Finally, territories, provinces, autonomous provinces, national regions, districts, cities, and villages each have their own elected governing bodies or Soviets for the administration of local affairs, and they work in close consultation with the Government of the republic of which they form a part.

THE UNION REPUBLICS

Of all the Union Republics the R.S.F.S.R. is the most important economically, since it occupies about 78 per cent. of Soviet territory, and contains approximately half the population of the Soviet Union, and a great proportion of its industrial and mineral resources, as the figures shown at p. 175 demonstrate.

Within the R.S.F.S.R. the population (109 millions in 1939) is composed mainly of Russians. Hence it is the *Russian* Republic. In the same way, within the *Uzbek* Republic, for example, the majority of the people are Uzbek.

But the R.S.F.S.R. differs from the other Union Republics in that its territory is larger, extending across the entire

¹ These are the heads of Government departments, and correspond to ministers of State in other countries.

PERCENTAGE OF SOVIET INDUSTRIAL RESOURCES (ANNUAL OUTPUT) CONTAINED WITHIN THE R.S.F.S.R.

Total industrial output	70
Machinery	77
Tractors	70
Combine harvesters	60
Timber	90
Coal	40
Petroleum	20
Pig-iron	40
Nickel	100
Electric power	65
Land devoted to grain	70
Land devoted to technical crops	60
Land devoted to flax	80

Soviet Union, from the Baltic to the Pacific, while it contains a large number of small non-Russian national groups.

In the Far North there are small groups of native people living in the coniferous forests and Tundra lands, spending their lives fishing, hunting, and following the herds of reindeer. In the past they were almost entirely nomadic, and rarely kept cattle or grew crops. They are few in number and are spread thinly over vast areas. In fact, soon after the Russians had come to these lands in search of furs, gold, and timber, there were more Russians than natives. The same is true to a large extent of the native peoples of the Siberian steppe and the Far East. Hence to-day the population is predominantly Russian, with small groups of other nationalities in certain areas, marked on the map as Autonomous Republics and Provinces, or National Regions. The R.S.F.S.R. includes fourteen Autonomous Republics and six Autonomous Provinces.

Outside the R.S.F.S.R. the Ukrainian S.S.R. has the largest population (30,960,221, in 1939¹). The Ukrainians are a Slav people, formerly living on the borders of the early Russian State, on the rich steppe country which for long was the scene of fierce struggles with the Tartars, who came into Europe from Asia along this broad zone of grassland. When serfdom grew up in the Russian State to the north peasants

¹ Not including those parts of the Western Ukraine and Bessarabia which have come into the Republic since 1939.

escaped to the 'free lands' of the Ukraine, forming communities of 'free Cossacks' there. Thus the Ukraine developed a tradition of its own, while the language of its people is a strong variant of Russian.

The next largest Union Republic in European Russia is Byelorussia, the population of which, in 1939, was 5,567,976 (excluding Western Byelorussia, now part of the U.S.S.R.). Like the Ukraine, Byelorussia is a 'border republic,' standing between the interior of the R.S.F.S.R. and Poland, and in the past suffering from the conflicts which took place here when Russia was striving to maintain her western frontiers. The Byelorussians, therefore, have also developed a language and traditions somewhat different from those of the people of the central part of European Russia.

Moldavia is a small republic on the south-western border of the Ukraine. It includes part of Bessarabia.

In the north, the Karelo-Finnish Republic (established since 1939) stands between the Soviet Union and Finland. Although the figures showing the national composition of this region since the formation of the Republic and the addition of territory obtained from Finland are not available, it is probable that the Finns and Karelians together form a small majority over the Russians. Between Finno-Karelia and Byelorussia are the three new Baltic Republics of Estonia, Latvia, and Lithuania, with a total population of about six millions. These republics have always been bound to Russia for strong strategic, economic, and geographical reasons. They form the continuation of the Russian Plain from the interior to the Baltic, and are the natural gateway through which Russia has obtained access to Western Europe and the rest of the world since they were obtained for Russia during the eighteenth century. Strategically they are of great importance in the defence of Leningrad from attacks by land from the south, or by sea from the Baltic.

As part of the Russian Empire their economic life depended largely upon the great Russian market, and the flow of goods between Russia and its Baltic ports. After the defeat of Germany in 1918 forces of intervention prevented the inclusion

of these territories within the Soviet Union, and it was not until 1941 that they became constituent republics of the U.S.S.R.

The Estonians, Letts, and Lithuanians are distinct in appearance from each other, while their languages also are different. They are not Slavonic peoples.

The population of the Caucasus has a very varied national composition, the peoples of the republics of Georgia, Azerbaijan, and Armenia forming the largest national groups. In 1939 Georgia and Azerbaijan each contained over 3 million inhabitants, while the population of Armenia was $1\frac{1}{4}$ millions. Within the two former republics, however, there are a number of Autonomous Republics and Autonomous Provinces, forming the territories of some forty different nationalities. The Azerbaijan S.S.R. includes the Nakhichevan A.S.S.R. and the Nagorno-Karabakh Autonomous Province. The Georgian S.S.R. includes the Abkhazian A.S.S.R., Adjarian A.S.S.R., and S. Ossetian Autonomous Province.

Finally, Soviet Central Asia, the seat of many ancient states, contains five large national groups, each with its own territory in the form of a Union Republic. The Uzbek and Kazakh republics each contain more than 6 million inhabitants. Only the R.S.F.S.R. and the Ukrainian S.S.R. have larger populations. The Turkmen, Tadjik, and Kirghiz republics are smaller, each with a population of more than $1\frac{1}{4}$ millions.

The Uzbek S.S.R. includes the Karakalpak Autonomous Republic. The Tadjik S.S.R. includes the mountainous Autonomous Province of Gorno-Badakhshan.

It is important to understand how and why all these different peoples are governed, otherwise the names on the map seem strange and impossible to understand. Unless we realize that the national minorities now have books and newspapers in their own languages, conduct business and the government of their regions in their own languages, have schools, libraries, universities, and colleges, it will appear strange that among these formerly 'backward peoples' there are to-day important new industries and agricultural regions.

There has been a very great increase in both industrial and agricultural production in Russia 'outside Europe' within the last twenty years. The people of the Soviet Union now think of their land as a Union of non-Russians and Russians, each nationality taking its share of the government and economic planning of the country by participating in the work of the various Soviets, or Councils. That is why they generally refer to their country as the Soviet Union.

CHAPTER VII

Agricultural and Industrial Development

AGRICULTURAL DEVELOPMENT

NATURE has given the Soviet Union a great variety of climatic conditions and soils, and hence a variety of agricultural possibilities. From early times timber and furs were obtained from the coniferous forests, flax, honey, and rye from the deciduous forest lands, and silk and fruits from the south. But as soon as the Slav peoples colonized the black earth lands these former steppe regions rapidly became the most productive areas of Russia. The fertile soils had lain uncultivated for centuries, and where the rainfall was sufficient the land yielded rich returns of grain. In the western half of the Ukraine, where moister conditions prevail, sugar-beet has been introduced, while the drier steppe areas have for long supported large herds of cattle.

Although we speak of the black earth lands as having been cultivated, it would be more correct to say that they were plundered, for year after year the harvests were reaped, without any thought being given to the replenishment of the soil by means of fertilizers or crop rotation. Little attention was given to the protection of the fields from the hot, dry winds of summer, when the parched earth was often swept away in clouds of dust. Trees were cut near the banks of streams and gullies, and the latter gradually extended. At first this rapacious plundering of the land was confined to European Russia.

For long the Russian peasants were serfs under feudal overlords. Many of them escaped and made their way to the 'free' lands of the south or across the Volga. Even after the abolition of serfdom the land available for the peasants, especially in the richer southern regions, was not sufficient to support their families, so that there was continual land-hunger, and migration continued, extending into the Siberian

Steppe, where the same backward methods of farming were practised. Between 1897 and 1917 the population of Siberia doubled, and for this reason the population to-day is 90 per cent. Russian.

Because the easy development of wheat farming provided a large amount of grain for export, in addition to the furs, gold, flax, and timber from the north, products of the land were exported in large quantities, and manufactured commodities were imported. This meant that the mineral and industrial resources of the country remained almost untouched. From the time when Peter the Great built St Petersburg as Russia's western port foreign trade was regarded as being of the greatest importance. Large wooden ships with a displacement of up to 2000 tons carried grain up the Volga. It was transhipped to small barges for the journey along the system of canals and rivers linking it with Lake Ladoga and the river Neva. At St Petersburg ships from foreign countries were loaded with grain and timber, furs, flax, and hemp.

But this growth of the grain and agricultural export trade did not transform Russia into a modern agricultural country. The standard of life of the peasants was so low that the land-owners found it cheaper to use human labour than machinery.¹ Low quality in agricultural technique was counterbalanced by the quantity of land and the arduousness of labour. The peasants could not read or write, let alone appreciate modern scientific ideas about farming practice. Their small strips of land were not suited to the employment of machinery. In most parts of Russia the ancient three-field system was the basis of cultivation, the *Mir*, or parish council, having the authority to redistribute the strips of land amongst the peasant households from time to time. After the eighteenth century, however, it became possible for the individual peasant to make personal profit by selling his produce to the towns. The desire for private ownership of a fixed and definite area of land gradually brought to an end the redistribution of the strips, although the rotation of crops was still carried on according

¹ See "The Countryside Past and Present," in *The U.S.S.R. Speaks for Itself*, by V. P. Molyakov (Lawrence and Wishart).

to ancient custom, and most of the cattle were herded in common.

The result of the change from communal to private ownership was that the strips of land which the peasant received became divided among his family at his death, and after several generations many of the strips were so small as to be uneconomical. The peasant was driven off the land, being compelled to sell his small fields to some wealthy neighbour who was able to buy land, increase the size of his holding, and employ poor peasants as labourers.

But even this degree of consolidation of the small strips did not produce farms capable of using modern machinery and methods. The old three-field system of rotation could not be accommodated to meet modern ideas of crop rotation and replenishment of the soil. Even the most simple improvements were not adopted. Ten million wooden ploughs and seventeen and a half million wooden harrows were in use in 1910.

Although 80 per cent. of the population of Tsarist Russia depended upon agriculture, after the emancipation of the serfs in 1861 15 per cent. of the peasants were left without land and became agricultural labourers. The average size of the peasant holding was seven to ten acres.

In pre-revolutionary Russia, out of 907 million acres of land more than 376 million acres were in the hands of owners of large estates, about 198 million acres belonged to the more wealthy peasant-proprietors, and less than one-half of the land was left to be divided among several million 'middle' and poor peasant families.

In the north and elsewhere where communications were poor, farming was of the subsistence type. The yield from the soil was low. Only the vast amount of land in the black earth belt established Russia as the foremost producer of grain in the world. Yet in a country so rich in wheat black rye-bread was all that most of the people could afford to buy. In a country rich in coal and iron and the minerals needed for the manufacture of chemical fertilizers¹ there was no fertilizer

¹ In 1913 the production of fertilizers was 0.14 million tons, in 1940 3.6 million tons.

industry, and very little manufacture of agriculture machinery or of modern farm implements. Grain was produced where it was most easy to cultivate it. This, combined with the poor system of transport and periodic droughts in the south-east, resulted in the occurrence of frequent and regular famines in certain areas where there was a deficiency of grain, while at the same time there might be an abundance in another area.

After the Revolution of 1917 it was clear that although small-scale peasant farming might enable a considerable peasant population to make a living on a subsistence basis, there could not be a surplus of produce sufficient to support the large industrial population which would be necessary if Russia were to grow into a modern civilized state. New areas of land had to be developed, the yield of crops increased, new means of transport provided, careful crop-rotation and the use of fertilizers and selected seed had to be introduced into those regions already under cultivation; the map of agriculture had to be changed, and, the area sown to crops extended to the north, south, and east. The effectiveness of this rationalization of agriculture may be gauged by comparing the two following statements.

This is how Sir John Maynard describes pre-Revolutionary Russia:

The northern half of the agricultural zone of Russia was not self-supporting as regards food. The food surplus was in the south, and the north depended upon supplies from that source and upon the communications which brought them.¹

In contrast, Stalin described the position in 1939 as follows:

. . . during the last three years the base of market grain has shifted from the Ukraine, which was formerly considered the granary of our country, to the north and east, that is to the R.S.F.S.R. We know that during the last two or three years grain collections in the Ukraine have amounted in all to about 400 million poods annually, whereas in the R.S.F.S.R. the grain collections during these years have amounted to over 1100 million poods annually.

¹ *The Russian Peasant, and other Studies.*

This increase has not been brought about only by cultivating more land in those areas where agriculture had been carried on previously. The rationalization of industry demanded the opening up of entirely new industrial areas, spreading production more evenly throughout the entire country, and assisting the economic development of the various national republics and former 'backward regions', besides easing the strain on the transport system. The new industrial areas needed food, and the redistribution of industry demanded a similar redistribution of agriculture with intensive mechanization. Hence food, technical, and fodder crops were planted on an increasing scale in Siberia and Central Asia, so that these parts of the U.S.S.R. can now to a large extent meet their own requirements in food and raw materials.

The result of the expansion of the total acreage under crops is shown in the table at p. 190. The necessities of war (*e.g.*, the temporary loss of the Ukraine) have carried the process still farther, and between 1942 and 1943 sixteen million acres of new land were brought under cultivation. The production of human food, especially grain, has also increased in the densely populated areas outside the black earth zone. Hence the danger of food shortage owing to drought in the south-east has been eliminated, and the strain on the transport system eased, while in large areas of the Trans-Volga region irrigation now guarantees a stable harvest in spite of annual variations in rainfall. Although there has been no decline in grain production, there has been a sharp increase in the proportion of the total sown area devoted to industrial crops.

The new areas which have been cultivated and the new crops which have been introduced are described in the section of this chapter dealing with agricultural regions.

Perhaps the most outstanding and revolutionary change which has been brought about is the conversion of the Russian peasant holdings, and large estates, into a system of state farms and collective farms, equipped with machinery, research stations, schools, and colleges. This has not been

an easy process. Its success is reflected in the present high standard of agricultural science and practice in the Soviet Union.

State Farms

After the Revolution the land was declared to be the property of the people, held in trust by the State. Model state farms were set up as examples of what could be done by means of machinery and modern scientific methods. As industry developed, agricultural machinery was produced on a very large scale. The old wooden plough was replaced by the steel plough and the tractor. Many of the state farms were organized on land which had been previously uncultivated, as in the drier steppe lands of the south and east. Here the vast open prairies had been used in the past for the rearing of cattle. To-day some parts of these lands are huge cornfields, stretching as far as the eye can see, the largest grain farms in the world. The ploughing and harvesting is carried out by means of teams of ploughs, and combined reapers, binders, and threshers, drawn by powerful caterpillar tractors.¹ When it is particularly necessary to gather in the harvest quickly these machines can be seen working far into the night, their powerful headlights sweeping the landscape.

At each state farm there is an experimental station where scientists work on problems such as the improvement of breeds of cattle, or testing new varieties of wheat. There are colleges where young agricultural scientists and veterinary surgeons receive their training, and schools for the instruction of tractor-drivers and mechanics. At these farms all the harvesting is done by machinery, and over 90 per cent. of the other kinds of farm-work is carried out by mechanical means.

Altogether, there were in 1939 477 state grain farms, 771 farms raising cattle, 200 raising sheep, 629 raising pigs, while 168 raised crops of tea, cotton, other fibre crops, and tobacco. More than 640 state farms were engaged in the growing of

¹ In 1938 there were 85,000 tractors and 26,600 combines at work on Soviet state farms. A fully mechanized state farm uses six to nine man-hours of labour per hectare of arable land, while an individual peasant holding uses 230 to 280.

vines and fruits. There were also 102 state poultry farms, and 816 suburban market-garden farms. An interesting type of state farm is found in the Far North. Here there are thirty-one reindeer farms. Under natural conditions it is extremely difficult for the reindeer to find sufficient food during the winter, so that thousands of them die each year. By keeping large herds on the state farms, however, their numbers have been rapidly increased.

Altogether, there are now nearly four thousand of these large farms in the U.S.S.R., occupying 9 per cent. of the land under cultivation, and employing about one and a half million workers. The average size of a state farm in 1937 was 9884 acres. In 1939 the total area of all such farms was 168 million acres, including 30 million acres of arable land.¹

Collective Farms

The majority of farmers, however, work on the collective farms. There are about 243,000 of them, employing more than 93 per cent. of the peasants—more than 18 million peasant families. In 1938 they cultivated 293 million acres of arable land. The average arable area of a collective farm is 988 acres, and the total area of these farms is about 917 million acres.

What is a 'collective farm'? Perhaps the expression 'co-operative farm' would make the meaning clearer, for instead of each peasant family looking after its own small holding, all the land and livestock, together with the farm-buildings around a village, are pooled into one enterprise. Each family has its own house and kitchen-garden, with poultry, pigs, goats, and one or two cows. These are for the personal needs of the family. But in order to farm the rest of the land, the peasants come together at a general meeting,

¹ In 1928, 4.3 million acres of arable land were on state farms, served by 4651 tractors. By 1935 the area had grown to over 40 million acres, while the number of tractors had risen to over 85,500. In 1934 the size of many state farms was reduced, as they were too large, unwieldy, too specialized, without crop-rotation and livestock.

where they elect a chairman, book-keeper, and other officials, and make the rules for their collective farm.

The work is organized by departmental managers, and the farmers go out to work in groups which are called "brigades." Everybody is paid according to the amount of work which he performs. The ploughing of a certain amount of land, the milking of so many cows, so many hours of office work, is calculated as being one "labour day." Payment is made according to the number of labour days credited to each person.

After the harvest reserves of seed are set aside for the next season's sowing, and part of the harvest sold to the Government, the money being used for erecting new farm-buildings, buying new livestock, building new clubs or houses, perhaps a theatre, or a cinema—in fact, whatever the farmers may decide upon at the general meeting. A portion of the harvest is handed to the Government as income-tax, while payments have also to be made to the machine-tractor station, a Government department which supplies and repairs agricultural machinery. In return for the payments made to the Government, the farm receives a great deal of advice and assistance from experts, educational and health services, and so on.

When these payments have been made the remainder of the harvest is divided among the farmers in accordance with the number of labour days to the credit of each person. The peasant will probably store some for his own use during the year. The rest, and probably the whole if the crop is one which is of no immediate personal value, as in the case of cotton, is sold at the market or to the Government. In this way he receives his return for the work of the past year.

To-day the Russian village is no longer a collection of squalid and dirty huts, so common in the past. Every collective farm now has one or more nurseries, a school, a hospital, a club, a cinema, and a sports-ground. Neat houses, often built of wood, surrounded by gardens, line the village street. Well-planned farm-buildings cluster together at one end of the village. All these things are no longer novelties to the peasant. He no longer regards the electric light with a feeling

of wonder. It is in almost every home. Every district has its machine-tractor station,¹ which supplies machinery, and trains the farmers, men and women alike, to use it. Each farm has its own scientific laboratory, in constant touch with the larger research stations, so that experiments with new types of seed or fertilizer, new varieties of fruits, or the breeding of animals can be carried out in thousands of farms at once.

Apart from the small but well-equipped laboratories on the collective farms, there are 507 experimental farms, 367 experimental stations, and 90 research institutes. In 1939 more than 14,000 scientists were working in the higher branches of agricultural research.

There are still, of course, farms which are more backward than others. The same high level of achievement has not been reached everywhere. The great progress which has been made, however, was reflected in the exhibits at the All-Union Agricultural Exposition, held in Moscow in 1939. Delegations of farmers from all parts of the Union visited it, and it formed an outstanding example of the way in which the experience of the best farms is being transferred as rapidly as possible to the others.

We have seen that climate and soil limit the growth of plants and crops to certain regions. But the application of science to agriculture has made it possible to discover varieties of plants and crops which will grow outside these 'natural limits.' Sometimes plants are discovered which have never been cultivated before but have grown wild, apparently useless. In other cases, new types of plants have been produced by the cross-breeding, selection, and grafting of different species. Wheat, rice, cotton, and fruits such as oranges and lemons are now being grown in places where their cultivation was previously considered to be quite impossible. Marshes are drained, irrigation channels bring water to dry land,

¹ Of the sown area of collective farms, 72.4 per cent. was served by machine-tractor stations as early as 1935. By 1938 there were 6358 machine-tractor stations, and the collective farms employed 483,500 tractors (with a total horse-power of nearly nine and a quarter million) and 153,500 combine-harvesters. Over 90 per cent. of the major operations in sowing and harvesting are done by machinery.

wheat which is resistant to frost is grown within the coniferous forest zone. Vegetables are produced beyond the Arctic Circle. The use of chemical fertilizers and careful crop-rotation maintains the fertility of the soil.¹ Seventy per cent. of all the seed now sown on Soviet farms is of high quality, yielding far larger crops than the poor-quality, untested varieties.

Much has been done to develop animal husbandry. This is reflected in the increased area devoted to fodder crops—the area sown with such crops in 1940 was more than eight times greater than that of 1913. State farms, at which the best animals are kept, have been set up, as centres for the improvement of stock in the districts in which they are situated.

The illiterate peasant of old Russia no longer exists. His place is being increasingly taken by the intelligent modern farmer, well able to realize the value of the application of modern methods to his work.

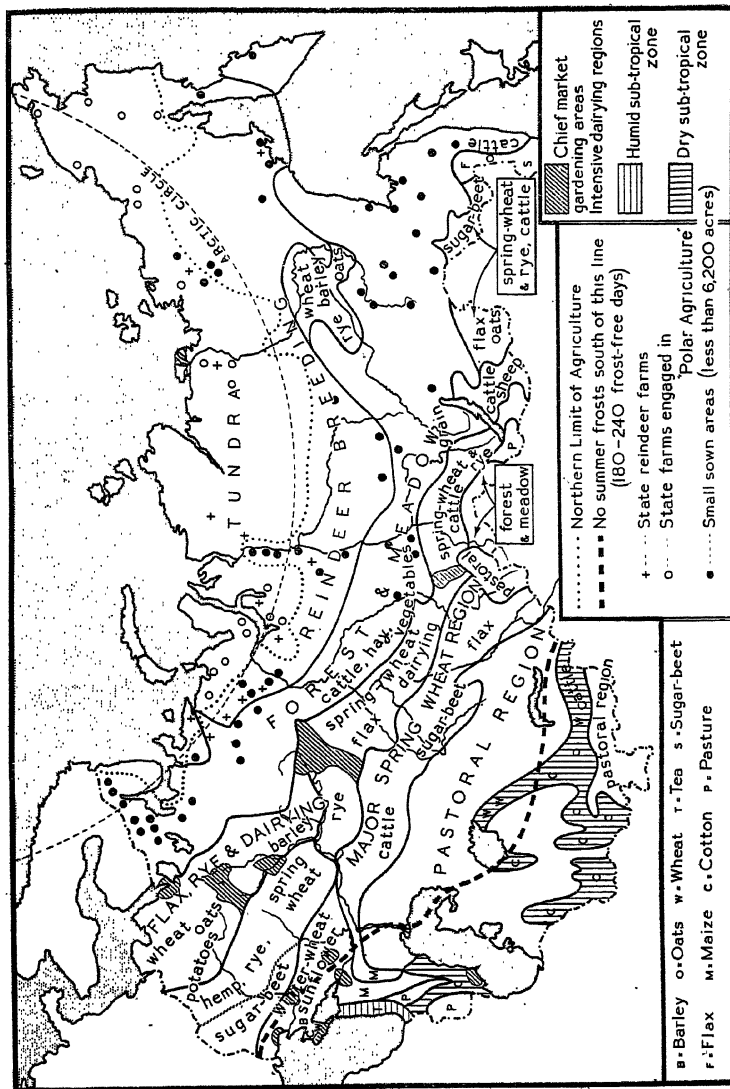
This new development of agriculture would be important enough if it applied only to "European Russia." In fact, however, some of the most outstanding advances have been made in Siberia, Central Asia, and the Caucasus, among the native peoples who used to be regarded as even more backward and ignorant than the Russian peasant.

AGRICULTURAL REGIONS

(see Fig. 19)

In the European part of the Soviet Union the types of crops grown vary from north to south, the change from the dominant cultivation of one crop to another being due partly to the less severe winters and longer and warmer summers experienced in the south, and partly to the improvement in the fertility of the soils and the increasing dryness of the summers.

¹ "We know that before the war we used about half a million tons of mineral fertilizers. . . . It is proposed, in the course of fifteen years, to increase to four million tons the consumption of fertilizers."—A. A. YAVRILOV, *Significance of the Progress of Applied Soil Science* (Academy of Sciences of the U.S.S.R., Leningrad, 1927).



AGRICULTURAL PRODUCTION

	PERCENTAGE OF TOTAL SOWN AREA		AREA SOWN WITH CROPS (million acres)		PRODUCTION (million tons)		ESTIMATED YIELD PER ACRE	POSITION IN WORLD PRODUC- TION
	1913	1938	1913	1937-41	1913	1936-40		
Grain . . .	89.8	74.8	233.3	(1938) 253.0 (1941) 277.8	78.74	(1938) 93.5 (1940) 119.0	(1913) 6.8 cwt. (1938) 7.4 cwt. ⁵ (1938) 7.8 cwt. ⁶	1
Wheat . . .		30.3	78.1	(1938) 102.7	30.57	(1938) 40.15	(1938) 7.2 cwt. (1938) 7.7 cwt.	1
Rye . . .		15.7	63.0	(1938) 52.3 ¹	—	(1938) 20.87	(1938) 7.6 cwt.	1
Barley . . .		6.7	28.4	(1938) 21.3	—	(1938) 8.20	(1938) 7.6 cwt.	1
Oats . . .		13.1	41.8	(1938) 44.2	—	(1938) 16.71	(1938) 9.0 cwt.	1
Maize . . .		1.9	3.5	(1938) 6.5	—	(1938) 2.70		
Industrial Crops .	4.3	8.0	11.2	(1938) 27.2 (1939) 30.2	—	—		—
Flax (long) fibre			2.5	(1938) 4.6	0.33	(1938) 0.54 ⁵	(1913) 2.5 cwt. (1938) 2.4 cwt.	1
Hemp . . .			1.6	(1938) 1.6	—	(1939) 0.165		3
Sugar beet . . .			1.6	(1938) 2.95 ²	10.73	(1938) 16.6	(1913) 6.7 tons (1937) 7.3 tons ⁷ (1913) 8.6 cwt. (1938) 9.8 cwt. ⁸	1
Cotton . . .			1.7	(1938) 5.1 ³	0.73	(1938) 2.7		3
Sunflower . . .			2.4	(1938) 7.8	—	—	(1938) 1.25 cwt. ⁴ (1939) 10.00 cwt. ⁴	—
Tea . . .			0.002	(1938) 0.125	.00013	(1937) 0.14 ⁴		—
Tobacco (Turkish)			0.073 ¹	(1938) 0.240 ⁴	—	—		—
Vegetables, melons and potatoes	3.6	6.9	9.4	(1938) 23.2 (1941) 28.5	—	—		—
Potatoes . . .			7.6	(1938) 18.2	22.9	(1938) 64.0	(1913) 3.0 tons (1938) 3.8 tons	1
Fodder Crops .	2.0	10.3	5.1	(1938) 34.8 (1941) 56.2	—	—		—

Other Agricultural Products:							
Citrus fruits	{ .001	{ (1937) 0.016 (1940) 0.05 All orchards	(1928) 2.0 million pieces	{ (1936) 293.0 (1940) 325.0 million pieces	—	—	—
Apples (estimated)	—	{ (1940) 3.21	—	(1939) 1.0 million tons	—	—	4
Pears	—	—	—	(1939) 0.39 million tons	—	—	3
Butter (estimated)	—	—	(1929) 0.078 million tons	(1938) 0.198 million tons	—	—	3
Hens' eggs	—	—	—	(1932) 7200 million	—	—	3
Milk	—	—	—	(1938) 616,060 million galls.	—	—	2
Granulated sugar	—	—	1.33 million tons	(1938) 2.53 million tons	—	—	1
Linseed	—	—	—	(1938) 0.75 million tons	—	—	2
Cottonseed	—	—	0.73	(1939) 1.90 million tons	—	—	3
Rice (rough)	—	(1939) 0.427	—	(1939) 0.36 million tons	(1913) 11.1 cwt.	—	3
Wool (greasy basis)	—	—	—	(1938) 135,000 tons	(1937) 17.9 cwt.	—	5
Silk (raw)	—	—	—	(1939) 1,800 tons	—	—	4
Total sown area	259.5	{ (1938) 338.4 (1941) 392.5	—	—	—	—	—

¹ Winter rye only. The area under spring rye was about 0.67 million acres.

² About 6 per cent. of the area and 6 per cent. of the yield of sugar beet was in regions not previously devoted to this crop.
³ Eighty per cent. of all cotton sown in 1937 was of the long-staple variety; 23.9 per cent. of the area under cotton and 9.1 per cent. of the total yield in 1938 was in regions where this crop had not previously been cultivated.
⁴ Estimated.

⁵ Average, 1933-37 = 7.2 cwt.

⁷ 1938 = 5.6 tons.

⁸ In irrigated areas = 11.4 cwt.

Towards the east, especially across the Volga, and towards the south-east, drought becomes a factor of increasing importance, while there is the additional difficulty of the carbonate accumulation in the upper layers of the soils. In Western Siberia the low density of population has restricted

LIVESTOCK (MILLION HEAD)

	1913	1938 (July)	ON STATE FARMS (1938-39)
Cattle	60.6	63.2	2.6
Sheep and goats	121.2	102.5	5.7
Pigs	20.9	30.6	1.8
Horses	35.8	17.5	2.0

PERCENTAGE INCREASE IN AGRICULTURAL PRODUCTION
(1913-39)

TOTAL SOWN AREA	AREA UNDER CEREALS	PRODUCTION OF CEREALS (by weight)
30.4	8.5	18.0

MECHANIZATION OF AGRICULTURE (1937)¹

REPUBLIC	H.P. OF TRACTORS	MACHINE- TRACTOR STATIONS	PERCENTAGE OF SOWN AREA SERVED BY M.T.S.
R.S.F.S.R.	5,015,000	3,813	91.0
Ukrainian S.S.R.	1,414,200	958	98.8
Byelorussian S.S.R.	128,300	140	86.9
Armenian S.S.R.	17,200	24	73.1
Azerbaijan S.S.R.	70,100	50	69.4
Georgian S.S.R.	34,200	44	70.3
Turkman S.S.R.	44,000	49	96.3
Uzbek S.S.R.	270,200	163	96.1
Kazakh S.S.R.	421,600	287	86.2
Tadjik S.S.R.	45,900	46	48.4
Kirghiz S.S.R.	57,800	43	79.2

¹ From *Twenty Years of Soviet Power* (Moscow, 1937).

agricultural expansion in the past. This is now being overcome by the widespread use of machinery. In Eastern Siberia much of the land is forested highland. Along river valleys in the south, and in the separate small areas of steppe described in Chapter IV, the warm summers, drier than in Western Siberia, allow agricultural enterprises to flourish to a surprising degree, in spite of the severe winters. The Far East has an agricultural region with special characteristics, in the middle Amur and Ussuri valleys. The semi-monsoon nature of the climate has made possible the growth of such crops as rice and soya bean, in addition to grain and sugar-beet.

Although certain areas tend to specialize in the production of agricultural commodities for which the soil and climate are particularly favourable, the element of regional specialization in Soviet agricultural economy should not be too strongly stressed. The general trend in agricultural policy was outlined by Stalin in 1934, when he declared:

We no longer have regions which are exclusively agrarian, which would supply grain, meat, and vegetables to the industrial regions; nor have we exclusively industrial regions which can calculate on receiving all the necessary supplies from other regions. Development is proceeding towards the position when all our regions will be more or less industrial. . . . From this it follows that every region will have to develop its own agricultural base in order to be able to supply itself with vegetables, potatoes, butter, and milk, and to some degree with grain and meat. . . .

The Tundra and Forest-meadow Regions

The long, severe winters, short growing season (70 to 125 frostless days), poor soils, and a subsoil which is permanently frozen everywhere in the Far North, and in numerous areas east of the Yenesei, provide serious obstacles to agriculture.

Deer-breeding has for long been one of the main occupations of the peoples of the Tundra and the northern borders of the forests. Lichens which lie beneath the snow provide winter fodder for the reindeer, which migrate southward towards the forest border at the end of the summer. In spring a northward migration takes place, and the animals feed

on the grasses and small plants of the Tundra vegetation. About 68 per cent. of the Tundra is suitable for deer-pasture, and of this 39 per cent. is considered to be suitable for winter grazing, and the remainder for summer pasture. Overgrazing has been the chief difficulty in the past. Lichens are slow-growing plants, and once an area has been overgrazed a period of ten years must elapse before the plants can fully re-establish themselves. There is always a danger of animals dying from starvation during the winter, for lichens provide the main item of food. The Soviet Government has established a number of reindeer farms (see Fig. 19), and has organized the native peoples into 'collectives,' instructing them in the correct regulation of the use of pastures, the prevention of fires which destroy plants and bushes during the summer, and the laying in of stores of hay and bushes as supplementary winter fodder, while the division of the pasture lands among the collectives, after a survey by a botanical expedition, is arranged in such a manner as to reduce to the minimum the long journey which is often made from the winter settlement to the summer feeding grounds.

Although agriculture is a recent innovation and is still of small dimensions, the diet of the people is now being varied to an increasing extent by the provision of vegetables and meat from new state vegetable, pig, and poultry farms which have been established in the north, chiefly near the new industrial settlements. Hot-houses are used during the winter, while advantage is taken of the long hours of daylight during the summer. By utilizing special frost-resistant seeds, even open field crops have been grown, although not yet on a large scale. In the Ostyak Vogul National Area, within the coniferous forest zone, potato yields of 10.77 metric tons per acre have been obtained. At Kirovsk, in the Kola Peninsula, the industrial workers in the new mining settlement are supplied with meat and milk and vegetables from a local farm (see p. 274).

The short summers and poor podsolized soils of the forests provide difficulties for the extension of farming on a large scale. But towards the south of the coniferous forest zone

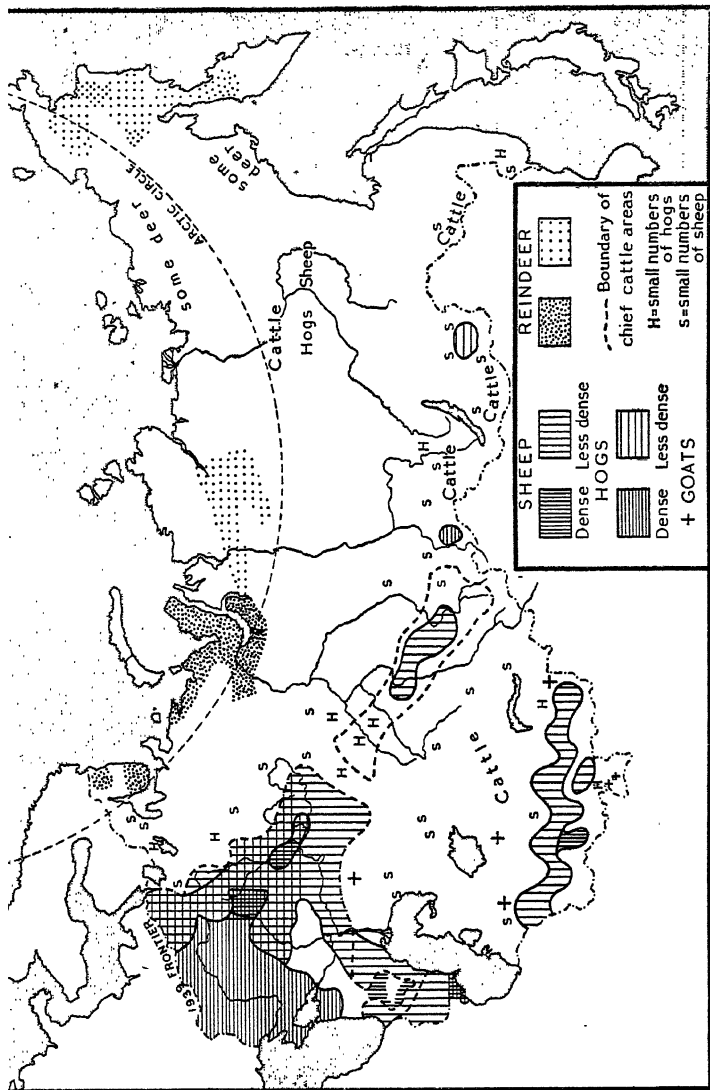


FIG. 20. STOCK-REARING

cattle are reared in the meadows, especially in the flood-meadows, and in the valleys barley, rye, and vegetables are cultivated. The yield of hay is often poor, but it has been doubled by sowing selected varieties of seed. At present, meadows occupy only 2 per cent. of the zone, and about half of this area is sown with grass for hay. In European Russia winter rye and oats are the main crops wherever agriculture is practised in the northern forest belt. With the employment of selected varieties of grain, the cultivation of these crops, together with spring wheat, has been extended into the southern half of the Archangel region, and beyond the Arctic Circle in the Komi Republic and the Nentsi National Region, where the climate is drier. In these Far Northern lands, barley occupies the greatest proportion of land devoted to grain. In Western and Central Siberia the grain crops mentioned above extend only to 60° N. The native people of the Yakut Republic have for long been renowned for their hay production and the rearing of cattle and horses in a most severe climate. Within recent years science has come to the aid of these people, and crops of spring wheat, rye, oats, and barley are now grown. The long, dry summer days, with a temperature remarkably high for the latitude, assists the ripening of the crops and compensates to some extent for the short growing season (see p. 319).

The Flax-Rye-Dairying Belt

From the early times when the Slavs cleared the deciduous forest lands and cultivated the soil, rye provided the main article of food, and flax was the basis of the homespun linen industry. The damp climate is excellent for flax, and as this crop makes heavy demands upon the soil, fodder grasses are grown in rotation. Thus flax cultivation and dairy farming generally occur together. Potatoes also form an important crop.

The relatively heavy rainfall (20-40 inches), and the summer showers which often accompany thunderstorms, made the ripening of wheat somewhat difficult. Rye, however, can withstand a damper climate as well as more severe winters, and oats can be grown where the summer is cool and damp.

In European Russia rye is most often the main winter crop, and oats, barley, and some wheat the spring crops. Much of the land is still under forest, and houses are practically all made from wood.

Within recent years the productivity of this region has been raised. The soils are not exceptionally fertile, and lime and fertilizers are necessary. With the introduction of varieties suited to the climatic conditions the amount of wheat grown has been considerably increased, mainly upon the glacial clays. In European Russia spring wheat is now grown in appreciable quantities as far north as 62° N., where the frost-free period is eighty days.¹ Vegetable, potato, and dairy farming are also of importance, especially near the large towns, while in Byelorussia potatoes are grown for the potato alcohol industry. In North-west and Central European Russia about 16 million acres of potatoes were sown in 1937. The area devoted to flax (long-fibre) was more than 4 million acres (in North-western European Russia and Western Siberia). This is the largest area in the world devoted to the production of this crop.

The Spring Wheat, Hemp, Rye, and Sugar-beet Regions

In the wooded steppe zone of European Russia the warmer summers, milder winters, and more fertile soils provide greater opportunities for the farmer. Winter rye, spring and winter wheat, sugar-beet, hemp and potatoes, are important crops to the west of the Urals. There are considerable areas of natural valley-meadows and sown meadow-grasses, both in the northern part of the wooded steppe zone and in the deciduous forest zone. Farther south, most of the land is under crops, and intensive cattle-, pig-, and poultry-rearing (based on sugar-beet waste, grain, and potatoes for fodder) is carried on. West of the Volga the country is thickly populated, and the climate relatively damp. Hence farming is on an intensive scale. The absence of drought and the high

¹ The cultivation of winter rye has also been extended northward during recent years, especially in European Russia, where there is more snow to protect the ground from frost than in Siberia.

natural fertility of the soil favour a high yield of grain and a stable harvest. The summers, long and warm, and sufficient rainfall favour the growth of sugar-beet.

East of the Volga the climate is semi-arid, and there is an abundance of land, thinly populated. Hence cattle-rearing and grain production are less intensive. In Western Siberia extensive wheat farming is accompanied by intensive flax and hemp cultivation. Dairy farming and cattle-rearing are based on natural pasture.

The Winter Wheat and Major Spring Wheat Region

This region almost coincides with the fertile black earth lands, now almost completely cultivated west of the Urals. Here the whitewashed thatched cottage, surrounded by fruit-trees and kitchen-garden, replaces the log house so common in the forest lands. Upon these soils the greatest degree of crop specialization has been attained. While from 50 to 70 per cent. of the flax and rye region is devoted to cereals, from 75 to 90 per cent. of the black earth lands are cultivated for cereal crops. The frostless season lasts from 140 days in the north to 200 days in the south, and the warm, dry summers, with July average temperatures of from 70° F. to 75° F., together with an annual precipitation of 15 to 20 inches, provide excellent conditions for the growth of grain.¹ Winter wheat, winter rye, and sunflower are the main crops in the Ukrainian steppe and the Azov-Black Sea territory, and more root crops are grown in these regions than elsewhere in the U.S.S.R. Sugar-beet is planted in rotation with wheat, since it allows the soil to regenerate after the previous crop, and so increases the yield of the wheat which follows. On the light soils around the shores of the Black Sea lies a concentrated area of barley-production.

Within recent years cotton has been introduced into the Southern Ukraine. Maize is also grown, and is a particularly important crop in the warm southern part of the Azov-Black Sea territory and in the Northern Caucasus region. Here, the

¹ See p. 203.

frost-free period is up to 240 days, and the July average temperature exceeds 75° F. To the north it is too cool for the growth of maize, and in the south it is too dry. Intensive cattle-, pig-, and poultry-rearing, together with the cultivation of the vine and tobacco, are also of importance in the territories mentioned above.

Owing to the absence of natural pasture, livestock is usually fed on grain, potatoes, and sugar-beet waste.

East of the Don, and to a greater extent east of the Volga, the lack of moisture is more pronounced. The annual precipitation is from 8 to 10 inches, with an early summer maximum. The only limitation to the yield of the grain crops is drought. The black soils are everywhere exceedingly fertile, and extend as far east as the river Yenessei. Large new areas have been brought into cultivation,¹ and large-scale mechanized wheat farming is the main occupation. The relatively light snowfall gives little protection from the severe frosts, so that wheat is usually spring-sown. It occupies up to 90 per cent. of the sown area. Millet is a popular 'insurance crop' in dry areas. Sugar-beet, however, is rapidly becoming a very important secondary crop. The cultivation of rye is widespread. In the highlands east of the Yenessei cultivation of both wheat and sugar-beet is limited to relatively small steppe and valley areas. There is abundant pasture in the valleys, and cattle-rearing is an important occupation.

Cattle and sheep are reared for milk, meat, and wool throughout the Siberian steppe, especially near the drier southern border. Dairy farming for butter production is an important occupation in Western Siberia. Fodder grasses are commonly planted in rotation with wheat. Near the big industrial centres vegetable farming and pig-rearing are the most important sections of agricultural economy after wheat.

A secondary area of wheat production is found in those parts of the Asiatic republics lying close to the mountains and in and near the valleys of the Syr Darya and Amu Darya rivers. The annual precipitation is above 10 inches, and the

¹ The lower Volga irrigation project will bring into cultivation a very large area of wheatland east of the lower Volga. See Chapter XV.

July average temperature exceeds 80° F. Rice, hemp, and sugar-beet are also grown. Cattle are reared in the mountain valleys, and on the dry steppe to the north of the main areas of cultivation.

East of the Volga farming is of the extensive type, large areas being sown to wheat, but the yield being rather lower than in European Russia. Dry-farming methods and the sowing of the crop relatively thinly in order not to make excessive demands upon the available moisture are responsible for this along the southern edge of the region. The relatively slight density of population is also an important factor. The farms are large and highly mechanized. Indeed, in all the grain farms of the U.S.S.R. there are four to five times as many tractor stations as in those of any other type. The extensive areas of uncultivated steppe land in the more arid parts of the Trans-Volga and North Caucasus regions support large numbers of cattle and sheep.

The Pastoral Region

This corresponds to the natural vegetation zone of dry steppe and semi-desert. The annual precipitation is below 10 inches, and tends to be irregular from year to year. This region supports large herds of cattle, sheep, horses, and camels. It supplies about 40 per cent. of the meat consumed in the Soviet Union. Originally the land was the home of nomadic herdsmen, large numbers of whom have now been organized into large state and collective cattle farms. Very little of the land is actually sown with grass. About 70 per cent. remains as rough pasture. Owing to the sparse vegetational cover, the herds need very large grazing grounds, while wells are of the greatest importance as sources of water. Thus farming in this region is most extensive in character.

The Caucasus and Trans-Caucasus

The agriculture of the Caucasus will be treated in some detail in a subsequent chapter. The mountain meadows and

intermontaine valleys and plains provide pastures for large herds and flocks, while in the lowlands, especially in the damper river valleys of the west, wheat, maize, barley, cotton, tobacco, grapes, and fruit are grown. The areas which specialize in sub-tropical cultivation are described below.

The Regions of Sub-tropical Cultures

These regions are distinguished by highly specialized and intensive types of agriculture, mainly of plantation character. (See Figs. 42, 51.)

The Dry Region. The southern and eastern parts of the Asiatic republics, together with an area extending from Azerbaijan, in the Caucasus, to the Aspheron Peninsula, occupy the most southerly parts of the U.S.S.R. The winters are short, with average January temperatures from 32° F. to 40° F.—the highest in the entire country. The July average is from 75° F. to 85° F. The summers are long and very dry. The annual precipitation varies from 8 inches in the lowlands to more than 20 inches near the mountains. Irrigation is practised on a large scale, and cotton is the most important crop. In Tadjikistan and Turkmenia plant growth occurs between November and May, so that winter crops are grown, especially vegetables. Many Mediterranean fruits have been introduced, and almonds, pomegranates, olives, apricots, peaches, and some quinine are cultivated.

The Humid Region. Close to the shores of the Black Sea, between Tuapse and the Turkish frontier (and including the Krasnodar district, Western Georgia, and parts of Azerbaijan), not only are there mild winters and hot summers, but the precipitation exceeds 40 inches. The soil conditions and the general tropical appearance of the natural vegetation have been described in Chapters III and IV. The hillsides and coastal lands support most of the Soviet tea-plantations, while citrus fruits and bamboo are also cultivated.

Tea. Large-scale tea cultivation in the Soviet Union is of recent origin. The plantations along the Black Sea coast did not exceed 2225 acres in 1913. By 1938, however, in West

Georgia and the Galski district of Azerbaijan, large areas of forest had been cleared, and the acreage of tea-plantations increased to 100,000 acres. The plantations are generally on terraced slopes. In 1938 the Georgian plantations yielded 1931 lb. of tea-leaves per acre. The average for mature, well-planted tea of good quality is 4 to 5 cwt. of finished tea, and about $1\frac{1}{2}$ cwt. for all plantations.

Azerbaijan is the second most important producer of tea, with 41,990 acres of plantations in the Talish region alone. The total area devoted to tea in the U.S.S.R. in 1939 was 125,000 acres. The area planned for 1940 was 139,600 acres.

Since the tea-leaves must reach the factory within two or three hours of being picked, factories have been built close to the plantations. The new factories in Georgia and Azerbaijan produced 6400 tons of finished tea in 1939.

Citrus Fruits. Georgia, in addition to being the chief region of tea production in the U.S.S.R., also supplies the greatest quantity of citrus fruits. In 1939, 39,520 acres of land were devoted to citrus cultivation. More than 700 types of fruits have been introduced from Southern Europe, Asia, Africa, and Australia. Oranges, mandarins, and frost-resistant lemons are cultivated near Sukhum, in the Adjar Republic, and in Azerbaijan. In 1940 the total area devoted to citrus fruits in the U.S.S.R. was 50,000 acres.

Other Crops. Of the many interesting new plants which have been introduced in the sub-tropical regions one of the most interesting is the tung, a tree which grows to a height of 8 to 10 feet, and produces a red-brown fruit which yields a valuable oil. From this oil a fire-proof, damp-proof, and acid-resistant polish is manufactured. It is widely used in the construction of motor cars, aeroplanes, and steamships, and also in the electrical industry. Three thousand tons of the oil were obtained in 1939 from the tung plantations of Georgia. About 30,000 acres of land were devoted to this crop.

The geranium is also cultivated for its oil, used largely in the perfumery industry. Eucalyptus, the sequoia-tree, with its hard, rot-resisting and fire-resisting wood, pomegranates, almond-trees, and olives are among the plants now commonly

cultivated. Quinine is grown in the Sukhum district, and in the Talish region there is a small area of rice-fields. Near Poti large tracts of the Kolkhiz marshes have been drained. They now support plantations of camphor-trees and mandarin oranges.

The Far East

The special climatic conditions of the middle Amur and Ussuri valleys have been described in Chapter II. Although the winters are cold and dry, the summers are hot, with the July average temperature rising from 61° F. in the north to more than 72° F. in the south. North-east and south-east of Blagoveschensk the annual precipitation, mainly in the form of summer rains, rises to more than 24 inches. This semi-monsoon character of the climate has resulted in the development of the cultivation of soya beans and rice in the south, while sugar-beet and wheat are of increasing importance. The rich river meadowlands support large herds of cattle.

THE RELATIVE IMPORTANCE OF VARIOUS SECTIONS OF AGRICULTURE

In almost every part of the U.S.S.R. where agriculture is practised grain crops—so important in agricultural economy as a source of food for both man and animal—occupy from 50 to 90 per cent. of the sown area. Grain crops as a whole occupy twice the area of land under all other crops. Their greatest concentration is to be observed in the steppe and wooded steppe zones, especially in the Ukraine and the pre-Caucasus. The Ukraine is especially important, since it lies close to the great centres of population and industry, and has a greater length of railways per square mile than any other area of the Soviet Union.

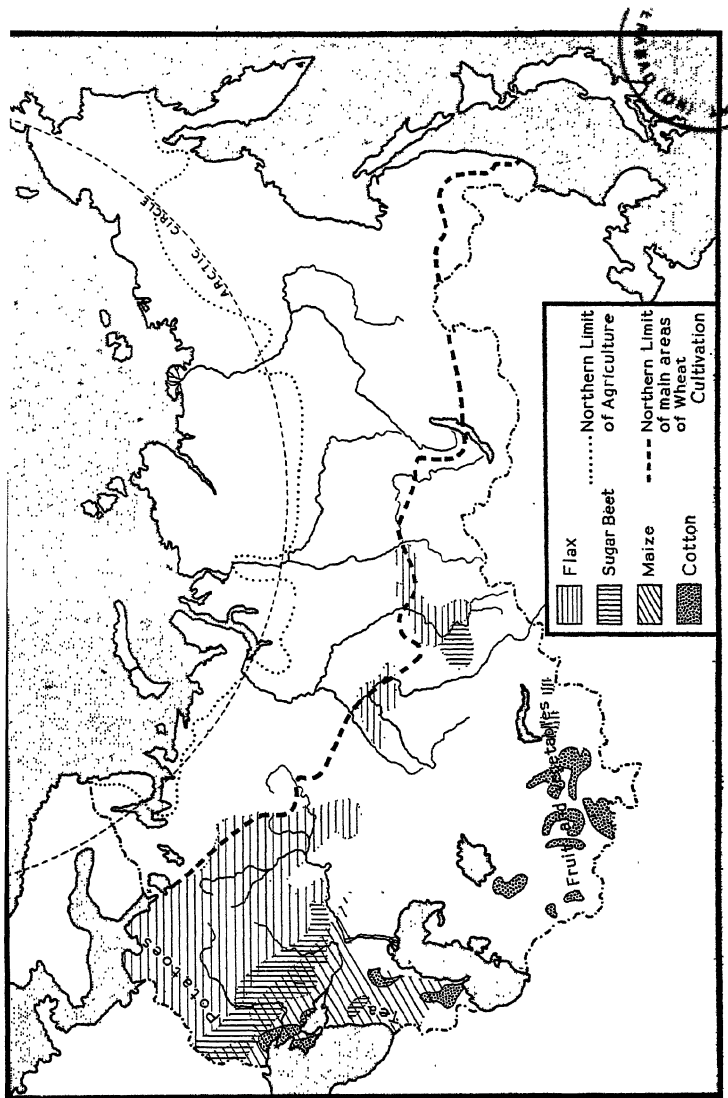
There is a dense agricultural population, and practically no unoccupied land. Hence collective rather than state farms were established here, and machine-tractor stations played an important part in the introduction of new farming technique. There is sufficient precipitation, and the summers are long, warm, and dry. Hence the yield per acre is high, with

little variation from year to year, and a stable harvest. Since there is no new land to be brought under cultivation increased productivity has resulted only from the employment of improved technique, which has brought about a steady increase in the yield of grain each year.

The second great grain-producing centre lies farther east, where there is a general deficiency of moisture and periodic droughts are usual (especially in the Trans-Volga, Stalingrad, Saratov, Kuibishev, Chkalov, or Orenburg, and Chelyabinsk regions). The less favourable climatic conditions are reflected in the lower yield per acre and the less stable harvest. At the beginning of the period of agricultural reconstruction there was more uncultivated land in these regions than in the west, and so large mechanized state farms were established. These are especially common in Western Siberia. Drought is being fought by means of irrigation, and in the Trans-Volga regions each year sees an increase in the area of irrigated land.

In Tsarist Russia wheat-growing was concentrated to a great extent in the black and brown earth zones—the 'producing regions,' in contrast with the densely populated northern 'consuming regions.'

The strain on the transport system and the occurrence of drought in the south were factors which influenced the Soviet Government in its decision to promote wheat cultivation in those areas which lie outside the black and brown earth zones. To the north there is much uncultivated land, while the moister climate enables a higher yield per acre to be obtained. The summers are sufficiently warm, and in fact the actual limit of the economic growth of wheat is now about 60° N. The poor soils, however, need lime and artificial fertilizers. The shorter growing season and the more severe winter conditions are being overcome by the introduction of new, quick-growing types of spring wheat, and frost-resistant types of winter wheat. The deeper snow cover and the protection of the fields from biting winds by forests and woods are factors which to some extent offset some of the more unfavourable conditions for wheat cultivation in the north and centre.



Wheat is the most important grain crop in the U.S.S.R., and has rapidly superseded rye in the making of flour for bread. The latter, usually a winter-sown crop, is cultivated throughout large areas of the northern regions of the Soviet Union. Wheat, more sensitive to cold winters and cool, short summers, becomes the dominant crop farther south, and here winter wheat prevails only towards the west, where the winters are less severe and the snow cover deeper than in the east. Spring wheat prevails east of the river Don. Winter wheat, limited by climatic conditions to the Ukraine, Crimea, pre-Caucasus, and Transcaucasia, is the more valuable on account of its higher yield per acre and more stable harvest.

Within recent years the use of new varieties has brought about an extension of the area sown to this crop to the north and east. At the same time spring wheat is now grown farther to the north than in pre-revolutionary Russia, both on newly-cultivated land, and in place of rye in those regions where agriculture has been practised for some time. Over the whole of the U.S.S.R. wheat now occupies on an average about 30 per cent. of the sown area. Over 3.75 million acres are on land where none was grown before. The areas devoted to this crop in 1913 and 1938 are given in the table at p. 190.

Rye is less susceptible to climatic variation and consequently, apart from its importance in the north, is grown practically everywhere. Only in Eastern Siberia and the Far North, where the winters are exceptionally severe, is it a spring crop.

Oats can be grown on poor soils, and, like barley, is a remarkably hardy crop. Its cultivation extends as far north as that of rye, but not so far north as barley. The latter takes the place of oats in drier regions both in the north and south, since oats require more moisture. The greatest production of oats is concentrated within a triangle bounded by lines joining the towns of Tula, Penza, and Kiev.

Barley, grown mainly for animal fodder (especially for pigs), and also for use in malting, is a crop which grows rapidly. Thus in the south it is able to complete its growth

before the hot, dry summer is established, while in the Far North it is able to mature during the short growing season. Hence it is important both in the extreme north and extreme south. About 50 per cent. of all the barley grown in the U.S.S.R. is cultivated in the Ukraine (especially on the light sandy soils near the coast of the Black Sea) and in the Caucasus.

Millet, even more resistant to drought than barley, is more sensitive to frost than the latter. It is grown chiefly in the Kursk-Tambov area of the central black earth region, where it replaces wheat in crop-rotation. It is the most important grain crop in the arid steppe region of Central Kazakhstan, where lack of moisture makes the cultivation of other grains practically impossible.

Maize, used mainly as fodder, is essentially a southern crop, requiring high summer temperatures. The chief areas for the cultivation of this crop are in the Ukraine and pre-Caucasus, where very high yields are obtained. During the last few years it has been introduced successfully to regions farther to the north.

Rice gives the highest yield per acre of all the grain crops. Climatic factors limit its growth to the south. Since the fields must be flooded at the time of planting irrigation channels must be constructed. About 300,000 tons of rough rice are produced annually in the U.S.S.R.; cultivation being concentrated in Transcaucasia, the southern parts of the Asiatic republics, and the Ussuri region of the Far East. With the introduction of cotton into the two former regions, rice cultivation has declined, and has moved somewhat farther north—into the pre-Caucasus and Southern Kazakhstan.

After cereals, industrial crops—those which provide industry with raw materials—are most important. They supply the textile factories with flax and cotton, the food industry with sugar-beet and vegetable oil, and potatoes for the production of starch and alcohol.

Obviously, the expansion of the area under these crops is inevitably bound up with the general expansion of industry, and the more efficient production of crops for human food

and animal fodder, since an increase in the area of industrial crops often implies a relative decrease in the area devoted to other plants.

Cotton is the most important raw material for the textile industries. Pre-revolutionary Russia was obliged to import nearly one-half of the raw cotton required by the textile mills. To-day most of it is grown within the borders of the Soviet Union, and the area devoted to this crop is almost eight times that of 1913. Nevertheless it occupies only about 1.5 per cent. of the total sown area as compared with 8.4 per cent. in the U.S.A. Production has increased rapidly, as is shown in the table at p. 190.

Although the cotton plant does not require an abundant rainfall, its roots need a considerable amount of water. This is supplied by irrigation in Soviet Central Asia, where most of the crop is grown. The hot, dry summers and long, sunny days common in the Asiatic republics are most favourable for cotton cultivation. The yield is high, and an ever-increasing area is devoted to fine Egyptian cotton (340,000 acres in 1938). Cotton is also grown, without irrigation, in new areas—the pre-Caucasus, the lower Volga, the Crimea, and Southern Ukraine. Lucerne is generally sown in rotation in order to restore soil-fertility, and provides an important supply of cattle-fodder.

Flax, in contrast to cotton, is a northern crop, growing best in damp regions, where the summer is cloudy and the average temperature is below 68° F. Hence it is concentrated in the deciduous forest zone, and to a lesser extent in the southern borders of the coniferous forest zone. It is not a suitable crop for the old three-field system. It makes heavy demands upon the soil, and must therefore be grown as part of a well-planned system of rotation, in which grasses, especially clover, play an important part. Hence flax cultivation and dairy farming, both suitable for relatively damp and mild climatic conditions, are usually associated in the same district or region.

The cultivation, harvesting, and processing of the crop require a great deal of heavy labour. The U.S.S.R. now

leads the world not only in the quantity of flax produced—80 per cent. of the world's production—but also in the widespread use of machinery for dealing with this crop. It is grown chiefly in Byelorussia, the Kalinin, Leningrad, and Smolensk regions, and to the north-east of these regions as far as Vologda and Kirov. Large new areas have been brought into cultivation on the southern borders of the Siberian forest zone. In the south (the black earth zone) flax is grown for seed- and oil-production. Hemp, which requires a warmer climate, is cultivated to the south of the main flax-producing zone, in an area bounded by lines joining the towns of Chernigov, Bryansk, Orel, and Kursk, and within a triangle between the towns of Penza, Ryazan, and Gorki.

The cultivation of the silkworm has been greatly improved. In 1938 approximately two to three tons of mulberry-leaf were produced per acre, and the annual output of silk cloth has now reached more than a hundred million yards. The chief areas of silk production are in the Turkmenian, Armenian, and Azerbaijan republics, the Melitopol and Odessa districts in the Ukraine, the Crimea, the Kara-Kalpak Republic, and other parts of Uzbekistan, the Kirghiz Republic, and other parts of Soviet Central Asia. There are twelve state farms devoted to silkworm culture.

The production of wool, unlike that of silk, is widespread. Sheep are reared in many parts of the U.S.S.R. The fine wool of the Astrakhan and caracaul sheep of Central Asia is known throughout the world.

'Southern hemp' has been introduced to several new districts—the Krasnodar region, Southern Ukraine, the Kazakh and Kirghiz republics. About 60 per cent. of the total world output is produced in the Soviet Union. Jute is also cultivated (in Uzbekistan), although on a small scale.

In the production of vegetable oils the sunflower is the most important plant. It requires a warm, dry, sunny climate and is cultivated on a large scale in the pre-Caucasus (especially in the Kuban lowland), South-eastern Ukraine, the Voronezh, lower and middle Volga regions, and the

steppe lands of the Southern Urals, Western Siberia, and Kazakhstan.

The U.S.S.R. now takes first place in the world in the production of sugar-beet. The main producing areas are in the wooded steppe zone of the Ukraine, especially in the lands along the western side of the Dnieper, and in the Kursk region, where there are rich black soils and there is sufficient warmth and moisture. In 1913 sugar-beet was almost confined to the Ukraine. To-day nearly 150,000 acres are under this crop in the pre-Caucasus, Transcaucasia, the middle and lower Volga regions, the Bashkir, Kirghiz, and Kazakh republics, in the West Siberian steppe, near the Altai, and in the Southern Ussuri basin of the Far East. In 1938 three million acres of sugar-beet were harvested—twice the acreage harvested in 1913.

Potatoes are grown universally for human and animal consumption, and provide raw material for the treacle, starch, and alcohol industries. Intensive cultivation and high yields require a well-worked soil and heavy application of manures. Light, friable, well-drained soils—sands, light clays, or black earth, in regions where there is sufficient moisture—provide the best conditions. Lack of moisture reduces the yield. Hence the most intensive cultivation is carried on to the north of the sugar-beet areas—between the latter and the centre of the flax-producing districts, in Byelorussia, and the Moscow, Voronezh, and Kuibishev regions. The acreage devoted to potatoes is now more than twice that of 1913.

Fruit, Wine, Tobacco, and Tea

Practically every state and collective farm has its orchards. The total area is second only to that of the U.S.A. More than twenty-two times the area devoted to fruit culture in 1913 now supports orchards. The total production of fruit in 1938 was $2\frac{1}{2}$ million tons. (See also p. 201.)

The main centres of apple production are in the western part of the Ukraine, especially around Podolsk and Kiev, and in the Crimea, the Leningrad region, Byelorussia, and

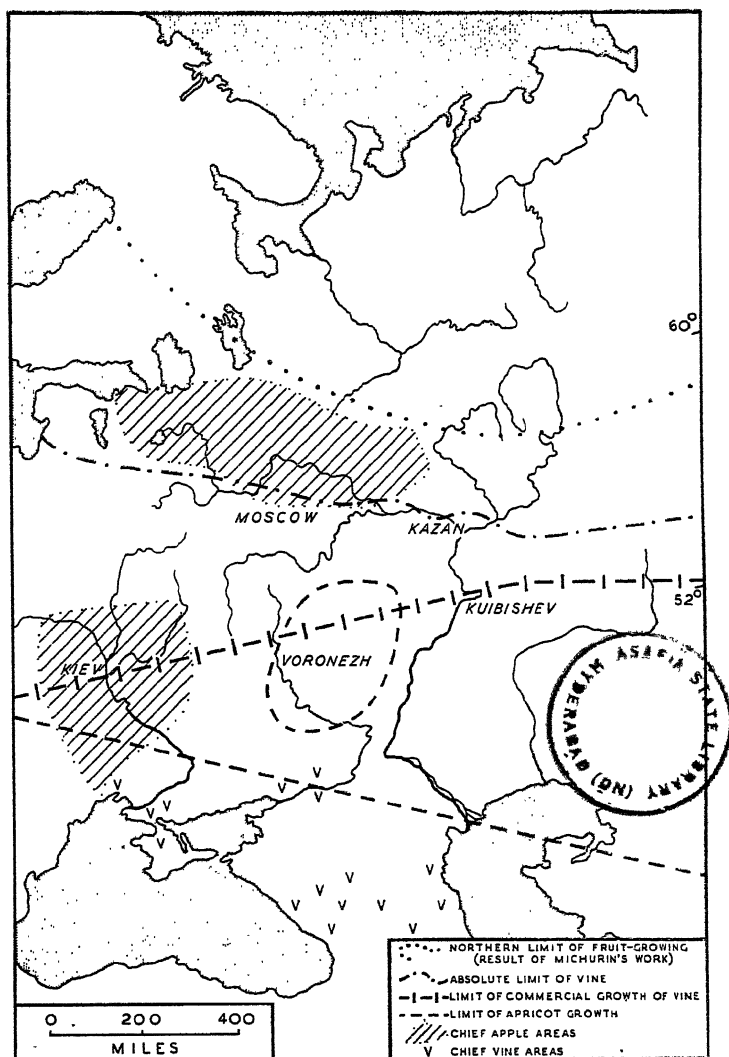


FIG. 22. THE CULTIVATION OF FRUIT

the central uplands between the Moscow region and the Ukraine. There are important state apple farms in Azerbaijan, and in the Ryazan district, in the R.S.F.S.R.

The work of the botanist Michurin has resulted in the production of new and improved varieties of apples to suit almost every climatic condition in the Soviet Union. Hence flourishing orchards have been established in many new districts—near Alma Ata, for example, and on the slopes of the Altai, where the snow cover is $1\frac{1}{2}$ to 2 inches thick and lies on the ground until the middle of June. In the experimental farm at Minussinsk, in the south of Central Siberia, there are 10 acres of apple orchards, in which the trees are trained to trail over the ground in order to avoid the killing frosts and biting winds of winter.

Similarly, the introduction of special varieties of vine has enabled its commercial cultivation to spread towards the north (see Fig. 22). The areas of greatest production are to the west of the Dniester river, near Odessa, in the Don valley, to the north-east of Rostov, in the Caucasian republics, especially along the Black Sea coast between Sukhum and Batum, and near Bukhara, Samarkand, and Tashkent, in the Asiatic republics. There are secondary areas in the central part of the East European Plain, especially in the Voronezh and Kuibishev districts.

Yellow, or "Turkish" tobacco, which needs a warm climate and damp soil, is grown near Maikop and in Abkhazia, in the Caucasus, and on the southern shores of the Crimea. The coarse tobacco known as "Makhorka" is grown in North-western Ukraine (the Poltava and Chernigov districts), and the Tambov and lower Volga regions.

Tea is grown near Batum, on the east coast of the Black Sea, and in the Lenkoran lowland, on the eastern shores of the Caspian. (See pp. 201 and 202.)

Vegetable Crops

It is clear from Fig. 21 that vegetable crops predominate in the Leningrad region, Byelorussia, and the Northern Ukraine—that is to say, mainly in the damper areas of the

East European Plain, and particularly near the large towns. There are also considerable areas devoted to these crops near the industrial regions of Siberia and in the Caucasian and Asiatic republics.¹

In the Murmansk and Archangel districts, as well as on the new northern state farms (*e.g.*, at Igarka, within the Arctic Circle), relatively high yields of vegetables and potatoes are obtained, averaging from 4 to 6 tons per acre. One farm in Yakutia has obtained a yield of 10·8 tons per acre of cabbage.

Fodder Grasses

Fodder grasses, the dominant crops after grain in many areas, occupy 56·2 million acres (1941)—as compared with 5 million acres in 1913.² Red clover mixtures constitute about 50 per cent. of the sown grasses, especially in the north-west, within a triangle formed by lines through the cities of Leningrad, Ivanovo, and Minsk, and in many parts of Siberia, between Omsk and Khabarovsk. Lucerne is important as a crop sown in rotation with wheat and cotton. It is also used for the grazing of cattle and hogs. In areas where limy soils prevail and where it is impossible to grow lucerne (south and west of a line passing through Gomel, Kursk, Voronezh, and Elitsa) esparto grass is commonly grown.

New Crops

Mention has already been made of the increasing cultivation of tea, cotton, and other sub-tropical crops. But in addition to these several entirely new plants, such as tung, described above, have been introduced—plants not previously cultivated commercially. New fibre plants have been introduced in order to supplement cotton as a raw material of the textile industry and to avoid dependence upon imported supplies of jute. Many rubber-bearing plants now occupy considerable areas. Perhaps the most remarkable achievement has been the large-scale cultivation of rubber plants, such as

¹ It should be noted, however, that the large crops of potatoes grown in Byelorussia are not entirely for human consumption. Large quantities are converted into alcohol.

² This represents the greatest increase in the sown area of any crop.

kok-sagyz, a close relative of the dandelion discovered in 1931 in the Tian Shan Mountains, tau-sagyz, and khondrilla. Kog-sagyz will grow on cultivated soils or peaty lowlands, and can be successfully cultivated in semi-deserts or as far north as 60° North Latitude. This plant is now grown in the northern half of the East European Plain as well as in the Ukraine, Transcaucasia, and Western Siberia. It yields about 2½ cwt. of rubber per acre (from 2 to 2½ tons of roots) in the second year, on good, well-cultivated soils. Recently, several thousand acres have been planted in Kazakhstan and the Central Asiatic republics. Altogether, there were in 1938 62,270 acres devoted to the kok-sagyz, and there are also several important plantations of other rubber-bearing plants. The soya bean, introduced first into the Far East, is now grown also in the Ukraine and North Caucasus. Among other new crops grown in the U.S.S.R. are rami, kendir, and kenaf,¹ relations of the cotton plant, which provide fabrics for a number of industries, including the aircraft industry.

Kendir is grown in the valleys of the Syr Darya, Amu Darya, Chu, Volga, Dnieper, Kuban, and Terek rivers. Sixty-five thousand acres were planted in 1933, including 25,000 acres in the Chu valley (Soviet Central Asia). One hundred and seventy-five thousand acres of land in the North Caucasus plains, Azerbaijan, and Uzbekistan, were devoted to the cultivation of kenaf in the same year. This plant yields a fibre used in the manufacture of sacks. Rami is grown in the damp sub-tropical regions near Batum and in the Lenkoran Lowland (1200 acres in 1935).

The table at p. 190 summarizes the relative importance of the various crops, and shows that in the Soviet Union a large part of the land is devoted to the growth of cereals. Of the

¹ *Rami*, or *Chinese Nettle*: A sub-tropical plant, the fibre of which is used alone; or together with cotton or silk, in the manufacture of fine or coarse fabrics. *Kendir* (*Apocynum venetum*): A plant which produces very strong fibre, of great value in the manufacture of hard-wearing cloth. It is grown mainly in the Asiatic republics. *Kenaf*, or *Bombay Hemp* (*Hibiscus cannabinus*): A plant grown in the Southern Ukraine, the Crimea, West Georgia, and Tadzhikistan. The fibres are used in the textile industry as a substitute for iute.

other crops we can distinguish certain areas where there is a specialization in one type. But if the soil is not to be exhausted other crops must be planted in rotation, and in fact there is a good deal of mixed farming, not apparent, perhaps, when we confine our attention to those crops which are particularly predominant in a given area.

Livestock

The most essential requirement for successful stock-rearing is a stable supply of fodder—grain, root crops, silage, meadow and pasture, or temporary grass, one of the most important features of modern crop-rotation. Waste from industrial processes such as the manufacture of sugar-beet often provides large amounts of feeding-stuff.

Tsarist Russia relied mainly upon 'natural fodder'—meadows and permanent grass. To-day the type of fodder varies from region to region according to the type of crops. The mountain pastures of the Caucasus support sheep and cattle. In Byelorussia pigs are reared on a large scale, and are fed on potatoes. In the black earth zone of European Russia, where there is practically no grassland, nearly all the land being under crops, pigs are fed on potatoes, and large numbers of grain-fed poultry are reared.

Meadows and rough grazing land are found to the greatest extent in those parts of the U.S.S.R. where the percentage of land under sown crops is relatively small—in the deciduous forest region to the north, the dryer steppe areas of Kazakhstan and the lower Volga, and the Alpine regions of the Caucasus and Central Asia. Between these northern and southern areas there is less meadowland and rough grazing, but sown grasses form an important part of agricultural economy, especially in the damper western regions of Byelorussia, and the Smolensk, Kalinin, Moscow, Yaroslavl, and Ivanovo regions. In the black earth zone livestock is fed almost entirely on grain, potatoes, sugar-beet 'waste,' etc. Stock-rearing based upon this type of fodder was impossible in Tsarist Russia, except on large estates. It is well suited to the well-organized economy of the collective farm or state

farm. Scientific crop-rotation, intensive animal-breeding, and therefore a steady supply of farmyard manure, are interdependent, one benefiting the other. They are common features of farming practice in the black earth lands of the U.S.S.R.

Since 1917 there has been a sharp increase in the area devoted to sown grasses. There has been a similar increase in the production of maize and root crops for fodder, while silage, unknown in old Russia, is now in common use (see table at p. 190). For the first time in Russian agricultural history mowing is carried on in the dry lands of the Trans-Caucasus, the pre-Caucasus, the lower Volga, Kazakhstan, and the Trans-Baikal area, providing hay for winter fodder, and allowing the farmers to maintain larger flocks and herds throughout the year.

The type of stock-rearing varies from one region to another according to the type of fodder available (depending largely upon climatic factors), the location of Government marketing and meat-packing centres, transport facilities, and the location of large urban markets.

Dairy farming is concentrated in the damper and formerly forested areas, in the north-west of the U.S.S.R.—in the Kalinin, Moscow, Yaroslavl, and Ivanovo regions, Byelorussia, the greater part of the Urals, the southern fringe of the coniferous forest belt, and in the valleys of Transcaucasia. Stock-rearing for meat production is confined mainly to Byelorussia, the Ukraine, the Smolensk and central black earth regions of European Russia, the middle and lower Volga, and the steppe lands of the southern Urals and Siberia. The production of wool and leather, in addition to meat, is important in Kazakhstan and Central Asia.

The dairy farms of the north depend largely upon meadows and permanent grass for pasture, although there are considerable acreages of sown grasses in the west. Milk production is important near the towns, while farther away the milk is used for making butter, which is better able to withstand the longer journeys. Thus in the Leningrad, Ivanovo, Moscow, Kalinin, and Smolensk regions only one-tenth of

the total production of milk is used for the manufacture of butter, as compared with one-half in the Vologda region and Western Siberia. The Caucasian and Altai valleys specialize in cheese production.

Meat production in the drier regions depends upon the extensive areas of natural grazing land, while in the pre-Caucasus and the Ukraine cattle are fed upon grain and root crops and certain 'waste' products of industry.

Pig-rearing is most strongly developed in Byelorussia, and the Smolensk, Moscow, Tula, Orel, and Kursk regions. The chief source of fodder is the potato. This branch of agriculture is important also in the Ukraine and in the pre-Caucasus. In the latter the pigs are fed chiefly upon maize.

In the early days of agricultural reconstruction the more wealthy type of peasant opposed collectivization of the farms, and opposition often took the form of the wholesale slaughter of livestock. Hence the building up of new herds of animals has been a major task. The greatest successes have been achieved in pig-breeding.

Numerous state farms specialize in the breeding of cattle and pigs, and near the large consuming centres many collective farms specialize in meat production.

Near the cattle-breeding regions, and close to focal points on the transport system, as well as in the large towns; great 'meat combines' and refrigeration centres have been established, where carcasses are prepared for market, meat and meat extracts are packed or canned, and a variety of meat products, such as hams and sausages, produced.

Sheep-rearing for wool production is important in Kazakhstan, the Asiatic republics, the Caucasus, and Siberia. The largest flocks belong to state farms. The greatest proportion of leather comes from the cattle farms of the Volga, Kazakh, and Siberian steppe.

Draught-horses and oxen are bred in the Ukraine, the pre-Caucasus, and the lower Volga region. In Transcaucasia the buffalo is often used, while the camel is common in the arid regions of Central Asia, and in the Tundra zone deer-breeding is an important occupation.

Hunting and Fishing

In the sparsely populated northern forest lands, where there is but little agriculture, hunting is the main occupation of the people. In the past large numbers of hunters and traders were attracted by the wealth which could be obtained from the fur trade, and unplanned exploitation led to the extinction of valuable fur-bearing animals in several areas. To-day hunting and trading is closely organized on a co-operative basis, and numerous trading-posts have been set up, and animal-breeding farms established.

Similarly, the fishing industry is now organized by State Trusts. At the main fishing centres there are stations similar to the machine-tractor stations on collective farms. They supply motor-boats, undertake repairs, and train mechanics. The industry employs about 220,000 fishermen and 130,000 other workers (total annual catch, 1.6 million tons).

The Caspian Sea yields one-quarter of the total annual production. The great influx of organic matter from the rivers, and the shallow waters close to the shore, provide favourable breeding- and feeding-grounds for fish. The chief centre of the industry, Astrakhan, lies at the mouth of the Volga, the highway along which fish is sent to the densely populated parts of the U.S.S.R., and close to the great salt deposits of Lake Baskunchak. Pike, bream, perch, roach, herring, and valuable fish of the sturgeon species are caught.

The growth of the second great centre of the fishing industry, in the Far East, has been limited by the great distance which separates it from the main consuming centres, lack of labour (owing to the sparse population), and, in the past, by the absence of salt, which had to be brought by sea, from the shores of the Black Sea. Recently, however, vast deposits near the Khatanga river, in Northern Siberia, have been opened. Salt is now shipped from Nordvik through the Arctic and Pacific to the Far East. Since there are no great consuming centres near the fishing-grounds, most of the catch is canned, and a considerable amount exported. The chief

fisheries are operated near the mouth of the Amur, and off the shores of Kamchatka, especially along the western side of the peninsula. Herring and salmon are caught (see p. 342).

Murmansk is the centre of the northern fisheries. Cod and herring form the greater part of the catch.

Fishing is also carried on in the Black Sea, the Sea of Azov, and at the mouths of the Ob, Yenesei, and Lena, in Siberia. Since 1932 a large number of ponds for the breeding of fresh-water fish have been constructed near Leningrad and Moscow, and supply considerable quantities of fish to the urban markets.

SOME SPECIAL PROBLEMS OF SOVIET AGRICULTURE

Marshes and Bogs

About 6 per cent. of the entire surface of the U.S.S.R. is covered with marsh or bog.¹

A great deal of attention has been paid to utilizing the marsh and bog lands agriculturally. Apart from the enormous growth of the peat industry, for the purpose of obtaining fuel and chemical by-products, peat is extensively used in the northern lands as mulch and cattle litter, and also as manure. In some cases it is previously saturated with a chemical solution containing the necessary fertilizers; in others, phosphoric iron oxide, found in the lower layers of peat bogs, renders the peat a natural fertilizer. In 1939 43,000 collective farms were using peat fertilizers.

The draining, drying, and ploughing (largely by mechanical means) of large areas of bog has taken place on a large scale, and near Murmansk, Leningrad, Archangel, and in the Kirov and Kursk districts excellent yields of vegetables are obtained from former bogs. In the Kursk district, and

¹ According to A. A. Yavrilov (*op. cit.*), in 1927 in European Russia alone 80 million hectares of land were unfit for cultivation and in need of improvement if they were to be made productive. One-fifth of this area was in the north-west, with a superabundance of water and badly drained soils. About one-sixth was in the arid districts of the south and south-east.

in Byelorussia, hemp and the kok-sagyz plant are successfully cultivated in such areas.

Soil Erosion, Afforestation, and Irrigation

In the black earth lands soil erosion, caused by the action of the wind, or by heavy downpours of rain during the dry summers, with the development of gullies and ravines, present the farmer with very serious problems.¹

It is important, especially towards the east, to conserve moisture in the soil, and in semi-desert regions valuable pastures may be lost on account of overgrazing, when the grass cover is broken by the hooves of the animals, and the soil becomes little better than drifting sand.

It has been found that many of these difficulties can be overcome by the planting of trees and woods. The trees act as wind-breaks, and prevent the removal of the soil in summer and of the snow, a valuable source of moisture as well as protection from severe frosts, in winter. Woods and forests raise the humidity of the atmosphere and retain moisture in the soil. Where trees have been planted on a large scale it has been found that the yield of grain and grasses increased considerably. Tree-planting also prevents the extension of gullies and ravines. Within the last ten years more than 740,000 acres of new woods have been planted by the farmers in the U.S.S.R.

On eroded and also on overcultivated or "spent lands" with marked deficiency in nitrogen, grasses and legumes are now introduced as part of a six-course rotation designed to restore the structure and fertility of the soil. Where soil erosion takes place on steep slopes terracing is usually practised.

Where the soil is light or sandy it is especially important that trees should be planted. Large areas of steppe near Stalingrad provide an excellent example of this practice, and close to the city large apricot orchards have been planted

¹ "During the last twenty-five years 135,000 acres of fertile black earths have been so removed and replaced by river sand. The Soviet Government has established a research station at Novosil, in the province of Tula, to consider these problems."—R. M. FLEMING, *op. cit.*

on the light soils. In semi-desert regions tamarisk and other grasses and plants have been sown, increasing the area available to pasture. In this way, about 61,000 acres of sands have been reclaimed.

Finally, dry-farming methods have been adopted throughout the dry regions, and in the lower Trans-Volga and the Asiatic republics large new areas have been brought under cultivation by means of irrigation (Figs. 42 and 48). In order to select suitable areas for irrigation, extensive soil surveys were carried out in Central Asia between 1925 and 1926.

SOWN AREA, NUMBER OF PEASANT HOUSEHOLDS, AND NUMBER OF WORKERS PER COLLECTIVE FARM BY REGIONS, 1938

REGION	COLLECTIVELY SOWN AREA (IN THOUSAND ACRES)	PEASANT HOUSEHOLDS	ACTIVE WORKERS ¹
Total Soviet Union . . .	1.2	78	169
North Caucasus . . .	3.3	151	—
Ukraine . . .	1.9	141	291
Eastern Russia:			
Lower and Middle Volga . . .	4.1	136	278
Ural . . .	1.9	83	183
West Siberia . . .	1.5	63	147
East Siberia . . .	1.2	62	160
Far Eastern Siberia . . .	1.4	47	121
Kazakhstan . . .	1.7	79	161
Uzbek Republic . . .	0.7	89	210

¹ Figures for 1937.

The tables at pp. 222-26, which do not include data for Byelorussia, the Transcaucasus, or the European part of the R.S.F.S.R., are based upon statistics taken from "Eastern Russian Agriculture" and "The North Caucasus—a Russian Granary," by L. Volin, in *Foreign Agriculture* (U.S. Department of Agriculture, March 1942 and July 1942 respectively). They show clearly the effect of climate and density of population upon agriculture east of the Volga as compared with that of European Russia. Winter-sown grain decreases from 37 per cent. in the Ukraine to only 3 per cent. in the Altai region, owing to the more severe winters and lack of snow cover in the east. Beyond the Volga farms are larger and more highly mechanized, and about 50 per cent. of the land is on state farms. Extensive grain-cultivation predominates, and there are large numbers of livestock. In 1938 the eastern part of the U.S.S.R. possessed 40 per cent. of all cattle, 50 per cent. of sheep and goats—but less than 25 per cent. of the pigs of the Soviet Union.

AREA (IN THOUSAND ACRES) UNDER

REGION	WINTER RYE	SPRING WHEAT	OATS	SPRING BARLEY
North Caucasus . . .	1,302	2,895	1,467	3,810
Middle and Lower Volga:				
Kuibishev	2,195	3,242	1,047	171
Tartar	2,494	1,375	1,454	71
Saratov	1,732	3,054	725	319
Stalingrad	2,052	3,807	385	669
German Volga	664	1,566	101	209
Total	9,137	13,044	3,712	1,439
Ural:				
Perm	999	576	1,099	246
Sverdlovsk	461	741	687	131
Bashkir	2,047	2,609	1,635	79
Orenburg	1,397	4,345	925	268
Chelyabinsk	911	4,160	1,669	246
Total	5,815	12,431	6,015	970
West Siberia:				
Omsk	768	3,468	1,594	273
Novosibirsk	1,086	3,104	2,148	190
Altai	235	6,094	1,794	112
Total	2,089	12,666	5,536	575
East Siberia:				
Krasnoyarsk	522	1,931	1,398	217
Irkutsk	392	485	456	105
Buryat-Mongol	27	329	210	36
Yakut	5	75	26	52
Chita	16	680	413	79
Total	962	3,500	2,503	489
Far Eastern Siberia . .	25	817	643	21
Kazakhstan ²	495	8,039	1,427	892
Soviet Central Asia:				
Uzbek	—	1,403	2	608
Turkmen	—	120	—	48
Tadjik	—	658	2	245
Kirghiz	1	701	207	459
Total ⁴	1	2,882	211	1,360
Total Soviet Union . .	52,337	66,538	44,187	21,033
Eastern Russia's Per- centage of Total . . .	35	80	45	27

¹ Including 378,000 acres under mustard seed.

² Less than 500 acres.

CERTAIN CROPS, BY REGIONS, 1938

SUNFLOWER SEED	POTATOES	VEGETABLES	LEGUMES	OTHER CROPS	TOTAL
1,813	523	361	101	19,105 ⁵	31,377
465	357	46	300	1,381	9,204
64	449	36	623	1,402	7,968
517	152	39	229	1,503	8,270
345	121	50	14	2,404 ¹	9,847
122	45	14	16	792	3,529
1,513	1,124	185	1,182	7,482	38,818
—	187	25	108	628	3,868
—	174	26	119	298	2,637
186	368	43	255	1,356	8,578
428	142	24	29	1,163	8,721
81	236	41	251	676	8,271
695	1,107	159	762	4,121	32,075
81	281	31	173	1,082	7,751
13	368	53	39	973	7,974
243	223	33	20	983	9,737
337	872	117	232	3,038	25,462
3	139	25	17	379	4,631
1	91	13	22	254	1,818
—	25	6	1	322	956
—	6	1	—	83	248
—	65	13	1	196	1,463
3	326	58	41	1,234	9,116
10	184	57	2	462	2,221
369	252	50	13	3,552	15,089
1	49	51	26	4,859	6,999
—	4	9	8	824	1,013
1	20	11	47	992	1,976
7	31	9	6	1,103	2,524
9	104	80	87	7,778	12,512
7,770	18,199	3,261	6,224	118,837	338,386
38	22	22	37	23	40

¹ In addition 383,000 acres were under winter wheat.

² In addition, 2,045,000 acres were under winter wheat and 277,000 acres under winter barley.

³ Of which winter wheat 8665, winter barley 703, maize 2480, rice 26, melons 354, castor beans 391, tobacco 67, cotton 525, fodder and hay 4573, others 1321 (thousand acres).

DISTRIBUTION OF LIVESTOCK, BY REGIONS, 1938 (IN THOUSANDS)

REGION	HORSES	CATTLE	PIGS	SHEEP AND GOATS
North Caucasus	1,000	4,278	1,989	7,389
Middle and Lower Volga:				
Kuibishev	233	760	273	1,361
Tatar	329	657	310	1,338
Saratov	116	556	246	986
Stalingrad	180	1,035	310	1,401
German Volga	34	220	119	291
Total	892	3,228	1,258	5,377
Ural:				
Perm	198	503	288	535
Sverdlovsk	187	600	261	470
Bashkir	459	1,136	342	1,765
Orenburg	190	858	191	1,253
Chelyabinsk	262	1,120	274	1,358
Total	1,296	4,217	1,356	5,381
West Siberia:				
Omsk	351	1,396	427	1,463
Novosibirsk	505	1,708	704	1,580
Altai	433	1,466	408	2,139
Total	1,289	4,570	1,539	5,182
East Siberia:				
Krasnoyarsk	328	767	383	1,265
Irkutsk	163	436	181	294
Buryat-Mongol	120	383	68	445
Yakut	163	392	14	(1)
Chita	213	502	137	833
Total	987	2,480	783	2,837
Far eastern Siberia	124	313	277	67
Kazakhstan	639	3,095	368	5,288
Soviet Central Asia:				
Uzbek	381	1,411	76	3,980
Turkmen	64	233	23	1,831
Tadjik	102	500	21	1,635
Kirghiz	362	486	91	1,886
Total	909	2,630	211	9,332
Total Soviet Union	16,221	50,921	25,716	66,595
Eastern Russia's percentage of Total	38	40	23	50

¹ Less than 500.

NUMBER OF TRACTORS, COMBINES, AND LORRIES, BY REGIONS,
1938

REGION	TRACTORS	COMBINES	LORRIES
North Caucasus	45,849	17,672	19,076
Middle and Lower Volga:			
Kuibishev	11,754	5,565	4,311
Tartar	5,944	2,799	2,780
Saratov	13,935	5,488	4,124
Stalingrad	16,068	6,232	3,786
German Volga	6,146	2,003	1,536
Total	53,847	22,087	16,537
Ural:			
Perm	5,114	1,773	1,545
Sverdlovsk	4,552	1,313	1,336
Bashkir	7,597	3,961	4,353
Orenburg	13,139	6,545	5,873
Chelyabinsk	14,453	6,871	5,746
Total	44,855	20,463	18,853
West Siberia:			
Omsk	11,253	4,982	4,738
Novosibirsk	10,304	4,308	3,529
Altai	14,749	7,291	6,213
Total	36,306	16,581	14,480
East Siberia:			
Krasnoyarsk	7,197	2,564	2,881
Irkutsk	3,076	832	869
Buryat-Mongol	1,248	275	911
Yakut	427	85	111
Chita	2,465	671	1,465
Total	14,413	4,427	6,237
Far Eastern Siberia	7,504	3,073	3,447
Kazakhstan	25,646	9,522	11,017
Soviet Central Asia:			
Uzbek	22,722	1,497	5,969
Turkmen	4,225	175	1,100
Tadjik	3,832	82	1,167
Kirghiz	5,128	779	1,984
Total	35,907	2,533	10,220
Total Soviet Union	483,513	153,792	195,770
Eastern Russia's percentage of Total	45	51	41

PERCENTAGE OF VARIOUS FIELD OPERATIONS PERFORMED BY
TRACTORS ON COLLECTIVE FARMS, 1937

REGION	SPRING			HARVESTING		AUTUMN	
	Plough- ing	Sowing		Grains and Legumes	With Com- bines Only	Sowing	Plough- ing
		Total	Grains				
Total Soviet Union	73·9	42·5	46·4	39·3	33·6	45·0	67·4
North Caucasus .	88·4	71·8	77·0	64·1	47·2	83·6	90·5
Ukraine .	85·0	39·9	44·6	44·5	39·6	38·7	71·6
Eastern Russia:							
Middle and Lower							
Volga .	91·4	75·5	85·1	74·5	58·9	85·0	84·9
Ural .	76·9	54·4	57·3	48·3	43·6	60·7	67·7
West Siberia .	68·4	50·1	39·8	47·4	45·9	43·9	80·5
East Siberia .	60·5	31·8	33·6	16·8	13·7	36·9	87·5
Far Eastern Siberia	97·4	65·3	75·1	83·4	70·5	60·7	95·6
Kazakhstan .	66·8	43·0	44·6	54·8	44·0	73·7	66·3
Uzbek Republic	(¹)	27·4	13·8	24·7	23·4	27·2	95·5

¹ No data given.

INDUSTRY

The essential requirements of industry are raw materials, power, or fuel, and transport to bring them together for the manufacturing process.

The U.S.S.R. possesses a large proportion of the power resources of the entire world. (See table at p. 234.) Much of the country's mineral wealth was unknown to Tsarist Russia, since only 0·25 per cent. of the Russian Empire had been covered by geological maps on the scale of 1/200,000 and 0·45 per cent. on the scales of 1/100,000 and 1/10,000.

By 1937, however, 43·2 per cent. of the U.S.S.R. had been geologically mapped—8·5 per cent. on the scale of 1/200,000 and 4·3 per cent. on the scale of 1/100,000 and on larger scales. Not only has geological survey revealed widespread and large mineral deposits, but many of them are to-day being exploited, so that the modern map of the distribution of industry in the Soviet Union is very different from that of 1913.

In spite of the rich resources of raw materials and power

Russian industrial development had not proceeded very far before 1917. What industry there was remained concentrated in the European part of Russia, and even here was confined to a relatively small number of areas around the cities of St Petersburg and Moscow, and in the Donbas (about 90 per cent.), with secondary industrial centres in the Caucasus, some towns on or near the Volga, and in western towns such as Minsk, which took advantage of transit trade between Russia and the Baltic coast.

The factory production of consumer goods was so small, and transport so poorly developed, that large sections of the population, especially among the peasantry, depended for clothing and household necessities upon peasant handicraft industry. Tula has long been noted for its samovars, Yaroslavl for homespun linen, the Nizhni Novgorod (Gorki) district for felt boots, caps, and so on. Exchange of products between one district and another was carried on at fairs, such as the famous Nizhni Novgorod fair.

The food and textile industries—the only ones developed to any considerable extent—depended largely upon agriculture for raw materials, and the colonial lands, which had practically no industries of their own, supplied a large proportion.

The output of coal and iron was exceedingly low. Britain produced thirty times as much coal (and seven times as much iron) per head of population.

Nearly 90 per cent. of the coal came from the Donetz coalfield. There are about 90 milliard tons of it here—coking coal in the west and anthracite in the east. The seams are rather thin (average thickness 1·6 feet) and consequently not cheap to work. But they lie close to the most densely populated parts of Russia, and within 250 miles of the Krivoi Rog and Kerch iron mines. About three-quarters of the production of pig-iron was smelted in the Don basin, although it was not used to any great extent near its place of origin since there was very little engineering and machine construction carried on there. These industries were confined to the centre and north-west of the East European Plain, in regions which produced less than 5 per cent. of the total output of

pig-iron, and only 10 per cent. of the coal. This obviously brought about a most irrational use of the already inadequate transport system.

The Expansion of Industry since 1917

Coal. To-day Donetz coal and coke supply many new centres of metallurgy and heavy industry in South European Russia, while the by-products of the coke industry are used by the Ukrainian chemical works.

In the past, 10 to 15 per cent. of the coal from the Don basin was transported for distances as great as 900 miles, and absorbed in the process about 40 per cent. of the capacity of the railway system. It was used in the Urals, while local coal and the Kuznetsk deposits remained neglected. It was carried to the Asiatic republics, when the Karaganda coalfield could have supplied the need. Locomotives hauling coal to Turkestan actually consumed 20 per cent. of their load on the journey.

The exploitation of new coalfields (Fig. 23) has not only increased the total output but, by enabling local resources to be more widely employed, reduces the amount of transport required.

In European Russia the highest quality coal comes from the Don basin. (It gives 7000 calories per kilogram of coal.) But in districts far away from the mines transport costs may offset this factor to a considerable degree. In the case of other coal deposits of lower quality (*e.g.*, Moscow coal, giving 3500 calories per kilogram) and with a high ash-content, transport would definitely be uneconomical. But it is now used locally, particularly since it yields valuable by-products for the chemical industry, while electric power-stations which have been built close to such coalfields are connected to the regional 'grid' transmission system and thus overcome the economic difficulty of carrying low-grade fuel for any considerable distance.

The industrial district of Leningrad saves annually some $4\frac{1}{2}$ to 5 million tons of coal which previously came from the

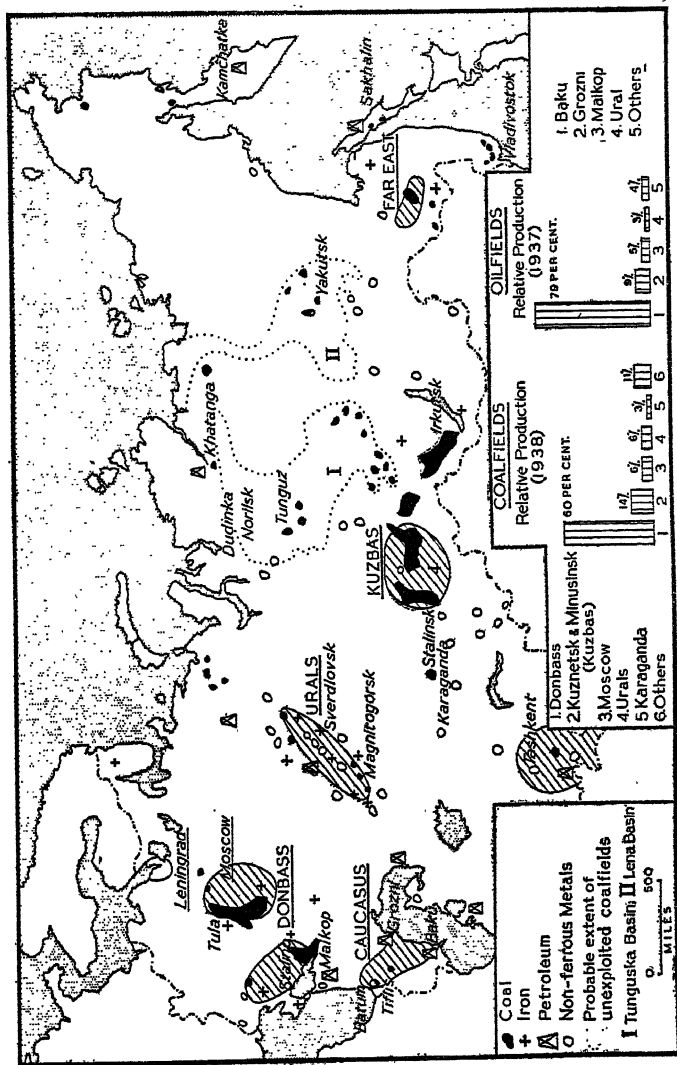


FIG. 23. ESSENTIAL MINERAL WEALTH AND CHIEF INDUSTRIAL REGIONS

Don basin, by utilizing brown coal from the Borovichi deposits. The Moscow industrial district is now consuming local coal to an increasing extent.¹

In contrast to these, the Kuznetsk coalfield of Western Siberia possesses thick seams of excellent coking coal with a high calorific value and low ash-content. The seams occur at a moderate depth, and are cheaper to work than those of the Don basin. The resources (450 milliard tons) are exceeded only by those of the Appalachian coalfield in the U.S.A. Almost untouched in Tsarist Russia, they to-day supply fuel to the great industrial centres of the Ural-Kuznetsk Combine (see p. 428). The annual output is now (1942) 20 million tons. In addition to the resources of the Kuznetsk basin, the deposits of the Krasnoyarsk region, only partially explored, are estimated at 67 milliard tons. The coal deposits of Western Siberia together contain about 40 per cent. of the total known resources of the U.S.S.R.

The third most important coal-producing region is the Karaganda basin, with estimated reserves of 50 milliard tons. It supplies coking coal to the Urals and the Asiatic republics, and produces fuel for the railways and the non-ferrous metal industries of Kazakhstan (see p. 394). The output in 1940 was $4\frac{1}{2}$ million tons.

Many other smaller coalfields have been brought into operation—in the Pechora basin (North European Russia), the Caucasus, Central Asia, at Kansk and Cheremkhovo in Central Siberia, in the Amur basin, and on the island of Sakhalin in the Far East. In the Urals, coal is now mined at Kizel, and near Chelyabinsk. In Soviet Central Asia the Kirghiz Republic has an annual output of more than two million tons from its mines. The Yakut mines produce about 60,000 tons a year and supply the Aldan gold-mining industry and shipping on the Lena and the Arctic sea-route. The Bureya deposits of the Amur basin have estimated resources

¹ Nevertheless, in the great industrial regions of Central European Russia and Gorki, Moscow, and Leningrad, two-thirds of the fuel employed is still imported from the Don basin and Baku, over one thousand miles distant.

of 1000 million tons of coking coal, and at present supply the steel mills of Khabarovsk (see p. 343). Although the output of many of these regions is at present relatively small, the potential resources are enormous. The Tungus basin alone, for example, is considered to possess the greatest coal resources in the world.

Forty-two regions now use coal from their own territories as compared with ten in 1929. This wider distribution of the industry has also been accompanied by a high degree of mechanization and the concentration of production in a relatively small number of very large mines in each coalfield.

The effect of the rationalization of the coal industry has been to increase the annual output from 29.1 million tons in 1913 (87 per cent. from the Donetz coalfield) to 132.9 million tons in 1938 (a little over 60 per cent. from the Donetz), and to increase the proportion of coal mined in areas outside the Don basin. It has been estimated that by 1940 the output had risen still further, to 164.6 million tons. Between 1938 and 1940 90 per cent. of the mining processes were performed mechanically.

The most recent development has been the underground gasification of coal, which was initiated in 1936. The coal is set on fire underground, and an air blast is pumped down to it. The gas and by-products are collected through pipes which come up to the surface at the other end of the seam. Eighty to 90 per cent. of the coal may be utilized in this way, as compared with 60 per cent. by conventional mining methods. This system was being operated in 1940 in sections of the Moscow, Donetz, and West Siberian coalfields.

Oil. Rationalization has also been effected in the distribution of the oil industry. Although as late as 1937 15 per cent. of the oil output of the Caucasus was transported more than 1000 miles, the establishment of new oil-producing areas is rapidly reducing transport. Not only have new oilfields been opened up in the older oil-bearing regions of the Caucasus, but wells are now in operation in the Turkmenian and Kirghiz republics, while between the Volga and the Urals a vast new oil-bearing region known as "the second Baku" has been

opened up, and now yields over seven million tons a year. Competent authorities believe that eventually the "second Baku" will produce more oil than the Caucasian wells.

In production the Baku oilfields occupy first place, and about half of the estimated resources of the U.S.S.R. are to be found here. Some of the oil is sent to the Batum refineries, from which petroleum is exported. The greater part is sent via the Caspian Sea and the Volga and its tributaries to the industrial centres of the U.S.S.R. The Grozny district is the second largest producer of oil, and from Grozny it is exported via Tuapse. The greater part, however, is transported overland, through Armavir to the Don basin and the Ukraine (see p. 469). The largest reserves of oil in the U.S.S.R. are now known to lie in the 'Second Baku' region between the Urals and the Volga, and in the Emba district. Wells are also being worked in the Arctic (in the Nordvik area) to supply Arctic aviation and shipping.

Improved methods of oil-extraction, together with the opening of new fields, have raised the annual output from 9½ million tons in 1913 to more than 32 million tons in 1940.

The oil-refining industry has also been rationalized. Refining is carried on both close to the oil wells (at Baku, Grozny, Armavir), in the industrial regions where it is used (*e.g.*, Orsk, the Don basin, Moscow, Ivanovo, Gorki, Saratov, Leningrad, etc.), and at the export ports (Batum and Tuapse).

PRODUCTION OF OIL AND GAS (IN THOUSAND TONS)

REGION	1913	1933	1938
U.S.S.R.	9,234·1	22,458·0	32,230·8
Baku	7,669·1	15,981·5	23,980·0
Grozny	1,208·2	5,053·0	2,763·6
Volga-Urals	—	36·3	1,298·4
Krasnodar	86·8	766·0	2,250·3
Far East	—	196·4	360·9
Turkmen S.S.R.	129·5	154·7	436·7
Uzbek S.S.R.	13·2	35·8	225·3
Tadjik S.S.R.	9·7	15·9	
Kazakh S.S.R.	117·6	198·1	

CRUDE PETROLEUM: PERCENTAGES OF TOTAL PRODUCTION

REGION	1913	1938
Caucasus-Caspian	97.1	90.0
'Second Baku' (Volga-Urals)	0	4.0 ¹
Far East	0	1.1
Central Asia and Kazakhstan	2.9	4.1

¹ Plan (1942): 14.7 per cent.

Economies are also being effected in the transport of wood and cement. The former, used as fuel and firewood, was formerly carried for astonishing distances.

Other Sources of Power. Power supplies have been supplemented by the use of peat as an industrial fuel. The peat-extraction industry, the largest in the world, is situated mainly in the north-west and centre of the East European Plain. The annual output in 1938 had reached 26.5 million tons. Peat cannot be transported economically, and hence it is used in factories and in electric power stations near the sources of supply. It is an important fuel for the industries of the Leningrad, Moscow, Ivanovo, and Yaroslavl districts.¹ The first power stations in the world to be operated entirely on peat fuel are in the U.S.S.R. Combustible shales are used as fuel in the Obshchy Syrt region of the Southern Urals, along the Volga, near Ulyanovsk and Syzran, and in the Leningrad, Gorki, and Kirov regions. The shales also yield benzine and by-products used in the chemical industry. But perhaps the most outstanding feature of modern Soviet industrial expansion is the large-scale electrification of the country, which is now served by a network of power stations, many of them hydro-electric, and several of great size, as, for example, the famous Dnieper hydro-electrical undertaking. The stations of the Far East and the Tuloma Arctic power station are examples of the widespread nature of the electrification of the country. All the chief electric-power producing

¹ No country has such large resources of peat as the U.S.S.R. The total reserves of peat suitable for use as fuel are about 150 milliard tons.

areas are now regions of heavy industry, many of them established since 1917 (Fig. 24). The Tuloma power station, for example, is one of a number designed to supply the Arctic regions of the Kola Peninsula, where, in addition to apatite, valuable iron ore has been discovered close to titanium-, molybdenum-, and vanadium-bearing minerals, as well as large quantities of limestone. It is planned to bring coal to this region from the Pechora coalfield (Fig. 25), and to create a new centre for the production of special steel alloys.

In 1913 the aggregate production of electricity in Tsarist Russia was only 1945 million kw.h., although the total power reserves (coal, oil, shale, peat, water, etc.) were enormous, as may be seen from the following table:

POWER RESERVES (1938)

	PERCENTAGE OF WORLD TOTAL	PLACE IN WORLD
Territory . . .	16.0	2
Population . . .	9.0	3
Coal reserves . . .	15.7	2
Oil	32.1	1-2
Peat	48.5	1
Forest area . . .	20.0	1
Water-power . . .	28.0	1

That these resources are now utilized in the production of electricity is seen in the increased output—from 1945 million kw.h. in 1913 to 25,900 million kw.h. in 1935, and 39.6 billion kw.h. in 1938.

The Moscow electric power system, with an annual output (1936-37) of more than 4000 million kw.h., is the largest in Europe and one of the largest in the world (*cf.* Niagara-Hudson system 5851 million kw.h., and the Hydro-electric Power Commission of Ontario, 4580 million kw.h.).

The Shatura and Kashira stations alone generate about half of the total output of the Moscow system—*i.e.*, more than all Russia's pre-war electric stations together.

This rapid electrification of the country has been accom-

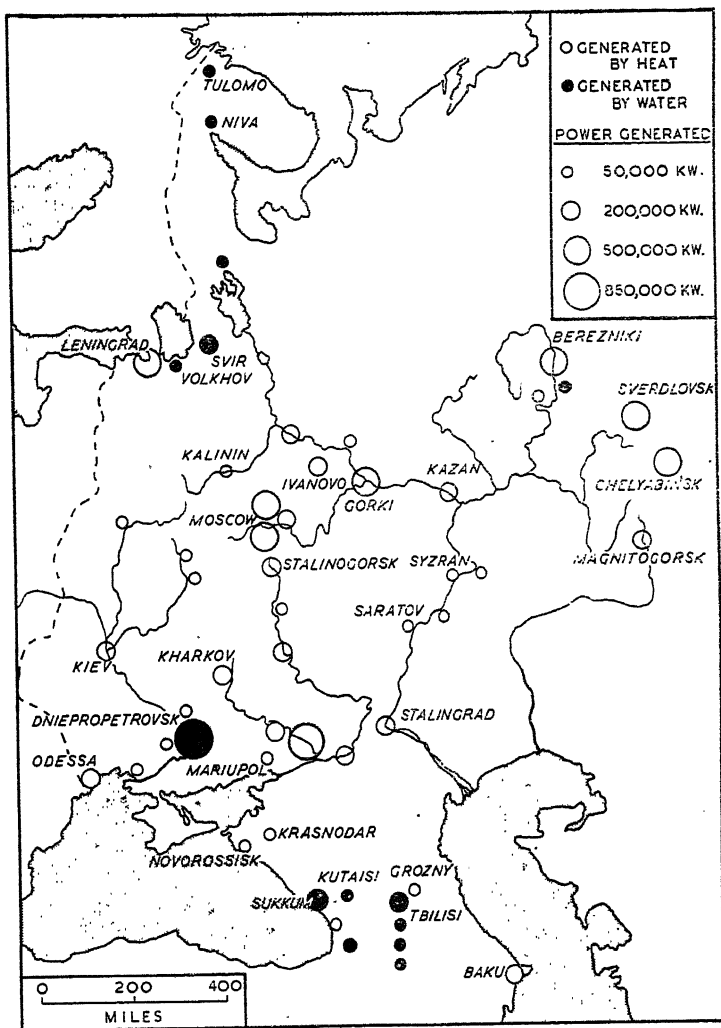


FIG. 24. THE GENERATION OF ELECTRICAL POWER IN EUROPEAN RUSSIA (1938-39)

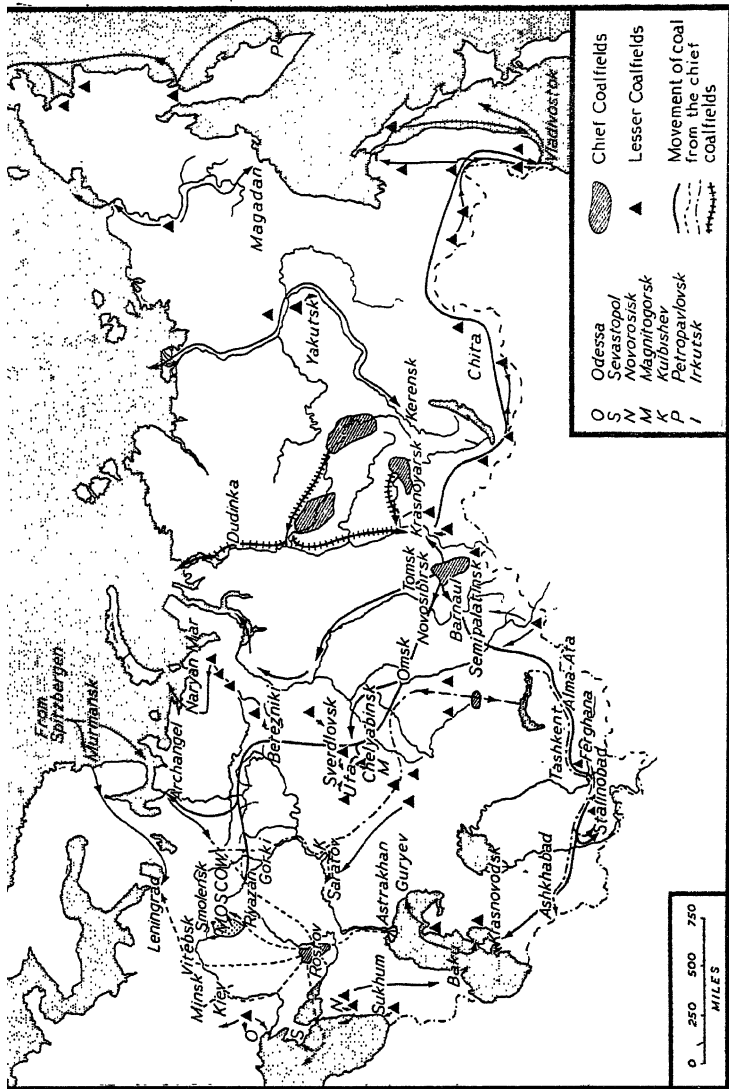
panied by the application of electrical power to the major industries. Thus 3440 kw.h. of electrical energy are used annually per worker in Soviet industry (*cf.* Germany, 3000 kw.h. per worker in 1930). Electricity is used even in agriculture, 4½ million acres of land being served by electric threshing machines as early as 1935.

One of the main features of the electrification of the U.S.S.R. has been the utilization of local fuels—peat, oil shale, coal-waste, anthracite, culm,¹ etc. Thus, the 180,000-kw. Shatura station, the 204,000-kw. Gorki station, the 111,000-kw. Red October station, and the 100,000-kw. Dubrovka station operate entirely on peat fuel, while brown coal from the Moscow basin feeds the 186,000-kw. Kashira station. In the Volga region local oil shale is now the main fuel for electric power generation. Water-power is also used in many parts of the Soviet Union. Between 1926 and 1940 thirty-four new hydro-electric stations came into operation, with a combined annual output of 11,000 million kw.h. Not only do these stations provide large quantities of cheap power for industrial and domestic uses, but they are also constructed as part of a vast scheme for the improvement of the navigation of inland waterways, and the opening up of great irrigation projects such as that on the lower Volga.

In 1937 67·2 per cent. of the electricity produced in regional stations was generated by local fuel (1932, 62·6 per cent.), 14·6 per cent. by water power (1932, 7·6 per cent.), and only 18·2 per cent. by "long-distance fuel" (1932, 29·8 per cent.).

MINERAL ORES AND THE METALLURGICAL INDUSTRIES. The U.S.S.R. is well provided with mineral ores (Fig. 23), especially in those areas where there are old rocks near the surface. In certain regions the rocks were folded in early times, and during a long period of denudation and erosion minerals have been exposed or lie at accessible depths. This is quite obvious if we compare the physical map of the U.S.S.R. (Fig. 1) with the map showing the distribution of minerals (Fig. 23). In old Russia relatively little use was made of this wealth. The iron industry was the first to be developed. As Russia

¹ Coal dust, especially of anthracite.



expanded iron was needed to supply the army with munitions, and Tula became the armoury of the whole country.

Iron was also mined and smelted in the Urals. Timber from the forests was used to provide charcoal for smelting. Both timber and iron were hauled for long distances, often along the frozen rivers in winter, by horses. It was said that only in the Urals did the output of iron vary from year to year with the oats harvest.

Coal and iron were mined in the Don basin. But, as elsewhere, the most backward methods were employed, so that the output was not high. Nevertheless, the iron and steel industries of the Donbas, established relatively late in Russian history with the aid of foreign capital, and employing coke in place of charcoal for smelting, achieved a higher standard of technique than that in the Urals,¹ where the industry soon fell into decay—partly due to the absence of coal. Charcoal-smelting strictly limited the size of the furnaces, and hindered large-scale production, thus making it difficult to compete with the large-scale and relatively modern enterprises of the Donbas.

With the expansion of new ironfields in the Urals and the recent development of mines in Western Siberia (Kuznetsk basin) the annual production of iron ore in the U.S.S.R. had risen to 28 million tons by January 1940. Two-thirds of this amount came from the Krivoi Rog mines in the Ukraine. The Ural mines provide about 8 million tons per year.²

Iron ore is found in the Urals from north of Nadezhdinsk to the Khalilov chrome-nickel iron deposits and the magnetic iron ores of the Magnet mountain, in the south. In the north-west are the Zigazinsk deposits, while in the north the Bakal ores are equalled in purity only by those of Sweden. Important deposits are also worked in the Tagil-Kushvinsk area.

¹ Before 1914 the southern part of European Russia produced three-quarters of the total output (4.2 million tons) of pig-iron, the central and neighbouring regions one-twentieth, and the Urals only one-fifth.

² Immense reserves of iron ore exist in the region of the Kursk magnetic anomaly. The metallic content is low, and the deposits occur at great depths. Some, however, occur at workable depths and are mined near Stari Oksol (see p. 543). Extensive iron quartzite deposits occur near Lake Imandra (Kola Peninsula).

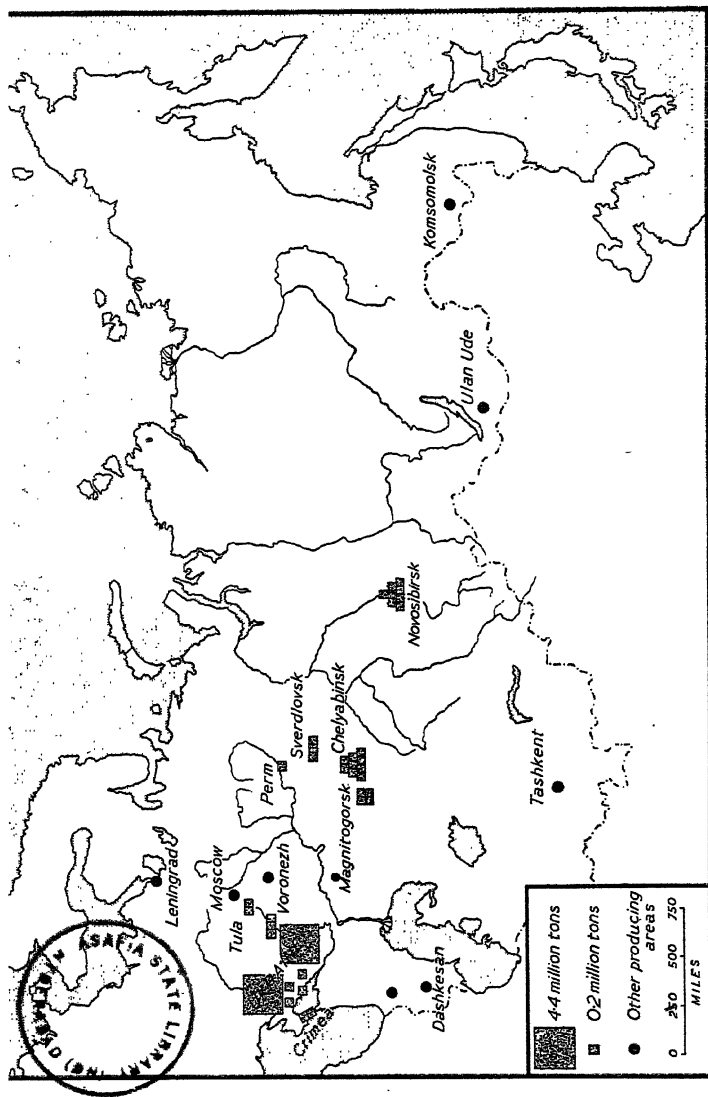


FIG. 26. THE PRODUCTION OF PIG-IRON

The total known reserves are estimated at 1600 million tons of high-grade ore. Coking coal is brought from the Kuznetsk basin, 1250 miles to the east, and also from the Karaganda mines. It has recently been found possible to use coal from the Kizel mines for the production of coke.

By 1937 the total annual output of pig-iron in the U.S.S.R. had risen to 14½ million tons. Many new metallurgical centres have been established in the Urals (*e.g.*, at Magnitogorsk, where since 1936 the cheapest pig-iron in the Soviet Union has been produced) and in Siberia (*e.g.*, in the Kuznetsk basin). In the Urals the presence of tungsten, nickel, chrome, wolfram, etc., together with the high quality of the iron ore and Kuznetsk coking coal, has resulted in specialization in the production of high-grade steels and alloys. The Kuznetsk mills of Western Siberia depended originally upon ore from the Urals. But iron from the Shoria mountain district, south-east of Stalinsk, is now also used here. The reserves of ore are believed to be about 300 million tons. The Stalin Metallurgical Combine alone produces 1·7 million tons of pig-iron and 2·1 million tons of steel per year. New iron mines have been opened in the Angara valley and the Amur basin, to supply the iron- and steel-works of Eastern Siberia (see pp. 356 and 362). Iron-works in the Yakut Republic have an annual capacity of 50,000 tons of pig-iron, while the Kom-somolsk mills (in the Amur basin) are said to manufacture 600,000 tons of finished steel products per year.

In these new centres of heavy metallurgy, and in the older ones of the Ukraine, Crimea, and the Rostov district, which utilize Donetz coal and iron from the Krivoi Rog and Kerch deposits (see p. 506), the most modern technical organization and equipment is employed. Full use is made of the by-products of the industries by grouping a series of factories to form a single economic unit—a great coke-metallurgical-chemical ‘combine.’

At Zaporozhe power from the Dnieper hydro-electric station, in conjunction with iron from Krivoi Rog and manganese ore from Nikopol, on the Dnieper, is used in the production of high-grade steel and alloys. In the central part of European

Russia the iron and steel industry is carried on within a belt extending north-east from Briansk to Gorki. The chief centres are in the Gorki region, the Voronezh region (at Lipetsk), and the Tula region (at Tula). Local ore is still used in the two latter regions. In all three regions the absence of large supplies of local fuel (charcoal was used originally) and iron ore has brought about specialization in the manufacture of products which require relatively small amounts of metal of high quality (*e.g.*, machine parts).

NON-FERROUS METALS. The U.S.S.R. is particularly fortunate in possessing supplies of those metals which are used in the manufacture of high-quality steels and alloys. About $2\frac{3}{4}$ million tons of manganese ore were produced in 1938, the Soviet Union occupying first place in the world in the production of this metal. Large supplies come from Nikopol in the Dnieper basin, and other deposits are mined in Georgia, at Chiaturi, in Kazakhstan, the Central Urals, and in Central Siberia, near Achinsk. Magnesium for use in aeroplane construction is made at Solikamsk in the Urals, and vast deposits are being worked on Olkhon Island, in Lake Baikal. The titaniferous iron ores at Kusinsk in the Urals, and in the Kola Peninsula, contain vanadium. Nickel ores are obtained in the Central and Southern Urals, the Kola Peninsula, close to the Yenesei estuary at Norilsk, and in Kazakhstan.

The first nickel works was erected at Upper Ufale, not far from Chelyabinsk, in 1934. At Aktyubinsk one-half of the nickel reserves of the Soviet Union are situated.¹

The U.S.S.R. produces 20 per cent. of the world's chrome ores, over a quarter of a million tons being mined annually. About 25 per cent. of this amount comes from a mine in the Urals, situated north-west of Sverdlovsk. Molybdenum is found in the Caucasus, the Lake Baikal region, Karelia, Kazakhstan, and the Far East. In 1940 the first molybdenum smelter was erected in Kazakhstan on the shores of Lake Balkhash.

Tungsten ores, important for the manufacture of machine tools, are mined to the south of Sverdlovsk, in the Urals, in

¹ According to S. P. Turin (*The U.S.S.R.*, Methuen), Soviet nickel in 1937 amounted to 6000 tons.

Transbaikalia, and the Far East. One of the largest deposits in the world is being worked at the Djidinsk Tungsten Combine in Buriat Mongolia. Gold, silver, and molybdenum are produced in addition to tungsten.

The most important centres for the mining of copper are near Lake Balkhash (Kazakhstan). Pyritic copper ores occur in the Urals, and there are important resources in Armenia, Azerbaijan, and to the north of Lake Baikal. The Central Urals Copper Smelting Combine near Sverdlovsk may be described as the Magnitogorsk of the non-ferrous metals industry. There are important resources in Armenia and Azerbaijan and to the north of Lake Baikal in Siberia. In 1938 the total output of copper was 103,200 tons. This is now exceeded by the refineries of Kazakhstan alone (100,000 tons were refined near Lake Balkhash in 1941). Zinc and lead are usually found together with silver, gold, and other precious metals, forming polymetalliferous deposits, such as are found in the Caucasus, Eastern Siberia, the Urals, Central Asia, and the Far East. Important new polymetal combines are situated near the foot of the Pacific slopes of the Sikhote Alin Range, in the Far East.

Twenty thousand tons of lead and 10,000 tons of zinc are smelted annually in the Caucasus at Sadon, while other large lead-zinc mines are in operation at Ridder in the Altai, the Southern Urals, the Kuznetsk basin, and the Kirghiz and Kazakh republics. Kazakhstan is the largest producer of lead, and the Caucasus of zinc, in the U.S.S.R.

The Soviet Union is the third largest producer of aluminium in the world. This industry relies upon low-grade bauxite deposits at Tikhvin, east of Leningrad.¹ High-grade ores are found near Sverdlovsk in the Central Urals, and at Nadezhdinsk, Alapayevsk, and Kamensk, while the huge nepheline deposits in the Kola Peninsula may eventually yield aluminium. About 175,000 tons of bauxite are produced annually.

¹ The Volkhov hydro-electric station supplies the large amount of power required to manufacture aluminium. Some of the Tikhvin ore is sent to aluminium works in the industrial region which has been established near the Dnieper Dam. The total aluminium output was 56,800 tons in 1938.

The output of platinum is now probably as great as that of Canada, which occupies first place in world production, while in the output of gold (over $4\frac{1}{2}$ million troy ounces annually) the U.S.S.R. ranks second only to South Africa. The Lena basin is the most important centre of production. In the output of tin (1937: 12,000 tons) the U.S.S.R. falls behind a number of other countries, and this metal has to be imported. About 65 per cent. of the Soviet production is believed to be in the Chita region. Tin-mining has also developed rapidly near Verkhoyansk in the Yana valley, together with nickel, molybdenum, lead, and silver. The West Verkhoyansk Tin Combine now employs over 5000 people.

Mention must be made of the apatite (calcium phosphate) and nepheline deposits of the Kola Peninsula. More than 2 million tons of apatite and half a million tons of nepheline are mined each year, in addition to considerable quantities of molybdenum, rare earths, and sulphate of iron (used for the manufacture of sulphuric acid). Nepheline is used in the aluminium and ceramic industries, while its potash content is used in the manufacture of fertilizers. Apatite is used to produce phosphatic fertilizers in a large new factory at Lenin-grad. The importance of these mineral fertilizers for agriculture cannot be over-estimated. In addition to the immense supplies from the Kola Peninsula there are vast deposits of phosphatic rocks of sedimentary origin in many parts of the Russian Plain. The largest deposits occur in the Kirov region, on the Vyatka-Kama watershed. There are others in the Moscow region (Voskressensk), the Gorki region (Chernorechensk), the Kursk region, the Ukraine (Konstantinovka), near Aktyubinsk, and in the Kara Tau in Kazakhstan. The U.S.S.R. possesses about 63 per cent. of the world's resources of phosphates (18 per cent. of world production).

Potash is another mineral essential to agricultural development. In 1929 vast deposits of common salt, together with potash and magnesium salts, were discovered at Solikamsk, in the Western Urals. Potassium salts have also been discovered in Western Kazakhstan, and altogether the Soviet Union now possesses 27,700 million tons of these deposits.

About 1.8 million tons were mined at Solikamsk in 1938 and utilized by the largest chemical combine in the U.S.S.R., at Berezniki. Here potassium and nitrogenous fertilizers are made. Coal from Kizel is used and the Kama river provides a transport route to the Volga. Nitrogenous fertilizers are also produced at Stalinogorsk (using coal from the Moscow basin), on the Donetz and Kuznetsk coalfields, at Gorlovka in the Ukraine, and at Chernorechensk (Gorki region). At the two latter towns nitrogen is obtained from the atmosphere.

The Chemical Industry. The chemical industry of the U.S.S.R., in addition to supplying agriculture with artificial fertilizers, provides other industries with essential materials such as soda, sulphuric acid, nitric acid, chlorine, ammonia, etc. In many industrial processes the chemical industry plays a leading rôle (*e.g.*, in the manufacture of soap, dyes, varnish, matches, rubber, paper, etc.).

Many of the chemical works form integral parts of giant industrial 'combines,' using the by-products of coke and metallurgical plants. 'Waste' products of the lumber industry (*e.g.*, sawdust) provide material for the manufacture of cellulose, artificial silk, spirit, etc., while alcohol and synthetic rubber are obtained from potatoes.

The great and widespread resources of coal, oil, peat, shale, and wood, phosphates, sodium chloride, potassium, sulphur, chrome ores, etc., provide abundant raw materials for the chemical industry. In spite of the widespread occurrence of these materials, however, 60 per cent. of the output of the industry in pre-revolutionary Russia came from Leningrad, and 16 per cent. from Moscow. Both cities are far away from the main sources of raw materials.

Colossal lacustrine deposits of sodium chloride are found around Lake Baskunchak and Lake Elton, near the lower Volga, and in other parts of Kazakhstan. It is found in rock form at Artyemovsk (in the Ukraine), Iletsk (in the Chkalov region), and in the Yakut Republic. It is also obtained from deposits at Solikamsk and in the Perm region (both in the Urals), and at Usolye in the Irkutsk region. Cheap transport and a supply of local fuel are important factors in the manu-

facture of soda, and in this respect the Urals chemical industry occupies a favourable position, since coal is obtained from the Kizel mines and the river Kama provides an excellent transport way.

The vast sodium sulphate deposits—7000 square miles in extent—of the Kara Bogaz Gol Bay, on the eastern shores of the Caspian Sea, are of great importance for the paper, dye,

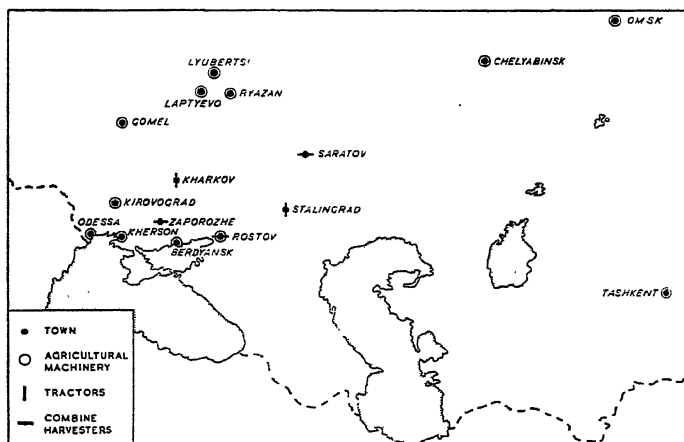


FIG. 27. LARGEST AGRICULTURAL MACHINE-BUILDING FACTORIES (1937)

glass, and metallurgical industries. They are used in the manufacture of a cheap substitute for sulphuric acid. Copper sulphate from the Urals, the Caucasus, and Kazakhstan, and sulphur from the Central Asiatic republics are used in the production of normal sulphuric acid.

The manufacture of synthetic rubber is particularly important. Without rubber the electrical and automobile industries would be unable to function. Since the Soviet Union does not include territory within tropical latitudes, if dependency upon foreign sources is to be avoided—a procedure which might be fraught with serious consequences

in time of war—rubber must be manufactured or produced from non-tropical plants. From the kok-sagyz plant (see p. 214) yields as high as 380 lb. of raw rubber per acre have been obtained. In Leningrad in 1935 the production of rubber from ethyl alcohol (manufactured from potatoes) was about 20,000 tons. Grain is used, too, one hundredweight producing 11 lb. of rubber. Rubber is also manufactured from ethylene, made from refinery gas in the Caucasus, and from calcium carbide at Erivan (see p. 481). Other factories are situated at Magnitogorsk, in the Urals (using Kuznetsk coal), and at Cherekhovo in Eastern Siberia, where calcium carbide forms the basis of the industry (see p. 546).

The output of the Urals synthetic rubber works, as well as others at Voronezh, Yaroslavl, and Efremov, is now of considerable magnitude. In 1940 about 80 per cent. of all the rubber used in the U.S.S.R. was synthetic, or was produced from cultivated plants such as the kok-sagyz.

Synthetic rubber is only one of a number of products of the chemical industry produced for the first time in the U.S.S.R. within recent years. Among others are alcohol from potatoes, artificial silk from wood, plastics, bromide, potash fertilizers, and iodine. The importance of wood-products in certain branches of the industry has rapidly increased and has been accompanied by an equally great expansion of the timber industry.

The Timber Industry. The U.S.S.R. possesses the greatest resources of timber in the world. Since 1917 large areas of virgin forest have been brought into use. The lack of labour in remote and thinly populated regions has been overcome by a high degree of mechanization of tree-felling, haulage, etc. Over 9000 miles of timber haulage roads have been constructed to allow transport of logs by tractor. More than 6000 miles of river channels have been prepared for timber floating, while in some 200 factories and mills, mainly in newly-developed forest regions, the wood is sawn and prepared for use, manufactured into standardized sectional houses and buildings, doors, window-frames, and veneers. In the 'Wood Combines' of the Archangel, Perm, Kirov, and

Sverdlovsk regions, the Finno-Karelian and Komi republics, Siberia, and the Far East all these processes are carried out in groups of factories working in close combination with each other. Chemical industries and the manufacture of paper are often carried on within the 'combines.' Archangel is the chief centre of the timber export trade. About one-half of the paper and timber produced in the Soviet Union comes from the northern and north-western parts of European Russia. About one-quarter of the paper comes from the Leningrad region. There are also important paper-mills at Kondopoga (Karelia), Sokol (near Vologda), in the upper Kama valley and the Western Urals, in the Gorki, Moscow, and Penza regions, and near Rzhev and in Byelorussia.

Engineering. The construction of machinery, especially lathes, machine-tools, and precision instruments, is the very basis of industrial civilization. Upon the machine-building industry every other industry depends. In pre-revolutionary Russia machinery was imported. Very little was manufactured in Russia itself. Engineering works were largely devoted to the construction of locomotives, and railway-wagons. The majority of engineering works were in the central district of European Russia, far removed from the metal-producing centres of the Ukraine, where only a few of the large works were situated.

New centres of the machine-building industry have been established (e.g., at Rostov and Saratov—agricultural machinery—and at Tashkent—textile machinery). Lathes, machine-tools, and precision instruments are made at Moscow, Leningrad, and Gorki. The largest tractor-building works are at Stalingrad, Kharkov, and Chelyabinsk. Motor-cars and lorries, which, like tractors, were not manufactured in Tsarist Russia, are mass-produced at the Stalin plant in Moscow and the Molotov plant at Gorki. The production of heavy lorries is concentrated largely at Yaroslavl. Diesel engines are made at Kolomna (Moscow region), Leningrad, and Gorki, turbo-generators at one of the largest engineering works in the Soviet Union, at Kharkov.

Some of the giants of heavy industry are situated in the

Urals, where machine-tools and equipment for steel, metallurgical, and engineering works throughout the U.S.S.R. are constructed. At Novokramatorsk and Sverdlovsk machinery for the metallurgical and mining industries is manufactured. Precision instruments are made at Zlatoust, Chelyabinsk, and Sverdlovsk.

The transport system of the Soviet Union is served by the older locomotive and wagon works near Gorki, Kolomna, Ordzhonikidzergrad, Bryansk, and Kharkov. There are newly constructed works at Novocherkassk (near Rostov-on-Don), Orsk (Urals), and Ulan Udé (Buriat Mongolia). The largest works are the new locomotive plant at Voroshilovgrad and the wagon works at Nizhne Tagil in the Urals. The Ulan Udé locomotive and wagon works supplies the railways of the Far East.

The biggest yards for the building of sea-going ships are at Leningrad, Nikolayev, Sevastopol, and Vladivostock. There are new shipyards at Komsomolsk-on-Amur. Rivercraft are built at the Sormovo yards (Gorki), near Kazan, Perm, Krasnoarmeisk (near Stalingrad), on the Volga, Kiev on the Dnieper, and Tyumen on the Ob-Irtysh system.

Thus not only has the engineering industry expanded and grown to an enormous extent, but it has been organized close to the chief centres of the metallurgical industry, in the Urals and the Ukraine. Machinery for agriculture, mining, transport, and textiles requires large amounts of nickel and other non-ferrous metals, in addition to steel. The general industrial expansion of the Soviet Union requires and produces large numbers of machines of all types.

The Urals occupy a particularly favourable position, standing midway between the densely populated urban and agricultural regions of the west and the new agricultural and industrial regions in the east. In addition to iron, non-ferrous metals, without which high-grade steel and alloys essential for machine-tools and machinery cannot be made, are found. The towns of the Urals are to-day supplying the U.S.S.R. with every kind of machinery—mining, agricultural, metallurgical, and transport equipment as well as precision tools,

instruments, lathes, and components for internal combustion engines. The engineering industry of the Ukraine is favoured by large supplies of iron and coal, and is in the most densely populated part of the U.S.S.R., where the products of the industry are in great demand.

On the other hand, the high technique and tradition of the engineering workers in Leningrad and Moscow have proved invaluable in creating bases for the technical reconstruction of the U.S.S.R. They serve as 'industrial laboratories' for the rest of the country.

New types of machinery are first constructed here, and then, after the experimental stages have been successfully completed, they are built elsewhere. Experienced engineers from these cities also go out to other parts of the Soviet Union to train less experienced workers.

Moscow and Leningrad are also important centres for the manufacture of precision lathes, electrical machinery, calculating machinery, watches, etc., requiring much skill but relatively little metal.

The production of some items of the machine-building and engineering industry is shown in the table at p. 258.

The Textile Industry. In Tsarist Russia the textile industry was one of the few to be developed to any considerable extent. It was one of the most mechanized industries, and produced goods mainly for the export markets. Textiles were exported to Iran, Afghanistan, and China. Almost the entire industry and two-thirds of the textile workers were concentrated in the central region of European Russia—chiefly in the Moscow and Ivanovo districts, and to a lesser extent in Leningrad. The centres of production were far away from the sources of raw materials. About half of the raw cotton came from the United States, and half from the colonial lands of Transcaucasia and Central Asia.

Although the textile industry is still largely concentrated in the older centres of production, many new mills have been built close to the sources of raw materials—at Barnaul, in Western Siberia, Tashkent and Ashkabad in Central Asia, in the Caucasian republics, and the middle Volga region.

The manufacture of silk, concentrated in the past almost entirely in Moscow, is now carried on in Leningrad, Kiev, Tbilisi, the Ukraine, Central Asia, the middle Volga region, Tyumen, and Omsk. Mills were being constructed in 1939 at Alma Ata, Semipalatinsk, and Kiev.

Combines for the treatment of flax and the manufacture of linen have been built in the flax-growing regions of Byelorussia, Western Siberia, and the Kalinin, Gorki, and Kirov regions.

The Ivanovo region accounts for about 75 per cent. of the Soviet production of linen. Other important centres are in the Leningrad region, and at Vitebsk, Sverdlovsk, and Biisk. New factories have been constructed or are under construction at Barnaul, Glazov, Orsha, Smolensk, and Vologda. Linen thread is manufactured in new factories in the North Caucasus and Lower Volga regions, Kazakhstan, the Kirghiz S.S.R., and in Western Siberia. The finest thread is produced in the Moscow region. The Orel and Tambov regions produce coarser thread. Ivanovo is the Manchester of the U.S.S.R.—the centre of the cotton-spinning and weaving industry. New mills have been constructed close to the cotton-growing regions of Central Asia, Southern Khazakhstan, Northern Caucasus, and in Western Siberia, the latter region receiving cotton from the republics of Central Asia via the Turksib Railway (see p. 408). The manufacture of cotton cloth is the most important section of the Soviet textile industry, and absorbs more than two-thirds of its employees.

The Food Industry. The location of the food industry depends largely upon the position of the sources of agricultural raw material and the position of the centres of consumption.

In Tsarist Russia it was as important as the manufacture of textiles—not because it was particularly highly developed, but because the other industries were weakly developed. Food production was, in fact, mainly of the handicraft type, concerned with the production of the most essential articles of consumption and concentrated near the consuming centres. Thus grain was converted into flour in peasant wind- or water-mills. Bakeries were small and primitive, and there was very little canning of fish and fruit.

To-day handicraft industry has been replaced by large mechanized combines. In Moscow, Leningrad, and Baku there are meat combines operated on the conveyor-belt system in which meat is cut and graded, important 'waste' products collected, and sausages, preserved meats, etc., manufactured. Refrigeration, and the production of fats, butter, margarine, and dried and condensed milk, are highly developed. Sugar is manufactured in the beet-growing areas—near the Volga, in Bashkiria, the Caucasus, Kazakhstan, Kirghizia, Western Siberia, and the Far East (see p. 259). The great meat combines are found both in the thickly-populated regions (at Moscow, Leningrad, Gorki, Sverdlovsk) and in the pastoral areas (Kazakhstan, Central Asia, the Volga regions, Southern Urals, and Eastern Siberia).

The Ulan Udé combine (in Buryat Mongolia) produced 25 million tons of canned meat in 1940. In the rich arable lands of the Ukraine and North Caucasus, with abundant supplies of vegetables, fruit, and vegetable oil, and in the Lower Volga, with rich supplies of fish, the canning and preserving industries have grown rapidly. In the dairying regions of Vologda, Bashkiria, and Siberia dried and preserved milk is manufactured. Treacle production is concentrated in the potato- and maize-growing regions of Byelorussia, the Ukraine, and the North Caucasus.

It must be remembered that the great industrial progress described above has taken place within twenty-five years. Tsarist Russia was not an advanced industrial country, but a backward agricultural state. Her vast resources had hardly been touched. Little progress could be expected, however, when one considers that between 70 per cent. to 80 per cent. of the people could hardly read or write, and less than 10 per cent. could be regarded as industrial.

Since 1917 the standard of education has been raised, and a large body of skilled workers created. During the Five Year Plans a heavy and then a light industry was created,¹ in order to provide in the first place the basis for the large-scale

¹ Eighty per cent. of the industrial output of the U.S.S.R. comes from enterprises constructed between 1927 and 1937.

manufacture of agricultural machinery and then consumers' goods. In 1913, 90 per cent., to-day only 60 per cent. of the industrial output comes from the Ukraine and Moscow and Leningrad regions. A new distribution of industry has taken place. The map has been changed with the creation of new coal and iron bases and new powerful industrial regions in the Asiatic republics, Siberia, the Far East, and Karelia. In both the old and new industries the most modern industrial improvements have been introduced. The Soviet Union manufactures its own machinery, and is practically independent of foreign countries for the supply of raw materials and manufactured goods. The country has been electrified by the construction of a vast electrical transmission system, connecting numerous new power stations. The annual output of electricity in 1937 had risen to twenty times that of 1913, and in the production of electrical energy the U.S.S.R. occupies third place in the world (39.6 billion kw.h. in 1938). In twenty years the Soviet Union has become one of the leading industrial nations of the world.

Large-scale planning of inter-district relations is well illustrated by the Ural-Kuznetsk Combine. Trains carry iron ore from the Urals to the Kuznetsk region, and return with coking coal. Thus each region receives supplies of that material which it lacks for its iron and steel industry. The recently constructed Turkestan-Siberian railway carries raw cotton northward to new textile factories in Western Siberia, and wheat and timber southward to the Asiatic republics, enabling each region to specialize in that type of economy to which it is most suited. The development of industry in the Krasnoyarsk, Irkutsk, and Chita districts, as well as in the Far East, has reduced the quantity of goods which had to be carried long distances by rail from European Russia to Eastern Siberia. The opening up of the Arctic sea-route during the short summer has made possible the beginning of the exploitation of the mineral and timber resources of Central and Eastern Siberia. Graphite, timber, and furs are now shipped down the Yenesei to Igarka, where they are loaded on to ships which carry them to Murmansk, Archangel, Vladivostock,

and abroad. The Yenessei has become the highway along which the wealth of Siberia is flowing in an ever-increasing stream. The construction of other ports along the Arctic coast is assisting similar development of many areas of the Far North.

The widespread industrial and agricultural developments described in this chapter have affected the economy and way of life of practically every one of the numerous national groups found in the Soviet Union. Literacy, education, and modern industrial technique have been introduced to large numbers of formerly backward and ignorant people. They, in turn, liberated from the bonds of superstition and ignorance, are rapidly seizing the new opportunities which have been offered to them, and have already contributed much towards the economic and cultural advancement of their respective territories.

BIBLIOGRAPHY

- H. BARON: "Synthetic Rubber," in *Discovery*, March 1944.
F. N. HOWES: "Russian Rubber Plants in Britain," in *Discovery*, January 1943.
F. G. KENT: "Underground Gasification of Coal," in *Discovery*, March 1944.
H. H. MANN: "The Recent Tea Developments in Georgia," in *Indian Tea Association Quarterly Journal*, 1932, Part 2, pp. 55-69.
L. G. MICHAEL: "Cotton-growing in the Soviet Union," in *Foreign Agriculture*, No. 2, 1938.
L. VOLIN: "The 'New Agrarian Order' in Nazi-invaded Russia," in *Foreign Agriculture*, No. 4, 1943 (U.S. Dept. of Agriculture, Washington, D.C.).
"War places New Burdens on Eastern Russian Agriculture," in *Foreign Agriculture*, No. 3, 1942. (Includes an account of agriculture in Russia, east of the Volga, up to 1938, and contains detailed tables.)
"Grain Exports of the Soviet Union," in *Foreign Agriculture*, No. 5, 1941.
"The North Caucasus—a Russian Granary," in *Foreign Agriculture*, No. 7, 1942.

PRODUCTION OF COAL, IN THOUSAND TONS

REGION	PERCENTAGE OF TOTAL PRODUCTION		COAL, INCLUDING ANTHRACITE AND BROWN COAL			BROWN COAL	
	1913	1938	1913	1934	1937-38	1913	1934
Pechora Basin	—	0.1	—	61	120 ⁽¹⁹³⁷⁾	—	—
Borovichi	—	—	—	17 ⁽¹⁹³³⁾	—	—	17 ⁽¹⁹³³⁾
Moscow	1.0	5.6	300	4,619	7,400 ⁽¹⁹³⁸⁾	300	4,619
Azov-Black Sea and North Caucasus	8.7	—	2,528	7,016	—	—	—
Ukraine	—	—	22,760	54,680	80,700 ⁽¹⁹³⁸⁾	—	200
Donetz ²	78.3	60.8	—	13	—	—	—
Crimea	—	—	70	234	500 ⁽¹⁹³⁸⁾	—	—
Transcaucasus	0.2	0.4	—	—	8,100 ⁽¹⁹³⁸⁾	317	2,569
URALS (total) ¹	4.2	6.1	1,217	5,508	—	—	—
Sverdlovsk (Kizel and Yegorshino)	—	—	1,085	3,372	—	185	463
Chelyabinsk	—	—	132	2,136	—	132	2,106
WESTERN SIBERIA (total)	2.7	14.0	800	11,947	18,600 ⁽¹⁹³⁸⁾	—	15
Kuznetsk ³	—	13.0	774	11,495	17,300 ⁽¹⁹³⁸⁾	—	—
EASTERN SIBERIA (total)	2.8	5.1	822	3,522	6,800 ⁽¹⁹³⁸⁾	313	830
Irkutsk	2.8	4.7	540	2,283	3,700 ⁽¹⁹³⁷⁾	—	18
Yakutsk	—	—	—	18	—	—	—
FAR EAST (total)	1.3	3.5	373	3,390	4,700 ⁽¹⁹³⁸⁾	103	2,315
Suchan	—	—	164	503	—	—	—
Sakhalin	—	—	33	436	—	—	—
KAZAKHSTAN (total)	0.3	3.2	90	1,920	4,200 ⁽¹⁹³⁸⁾	9	87
Karaganda	—	2.9	—	1,831	3,900 ⁽¹⁹³⁸⁾	—	—
Kirghiz S.S.R.	—	0.7	103	974	900	90	702
Other coalfields of Central Asia	0.5	—	55	38	—	28	28
Others	—	0.5	—	—	—	—	—
U.S.S.R. (million tons)	—	—	29.1	93.9	132.9 ⁽¹⁹³⁸⁾ 164.7 ⁽¹⁹⁴⁰⁾	1.2	11.4

¹ In 1938 more than 10 per cent. of total output was from large mines, producing more than half a million tons per year.

² In 1938 more than 20 per cent. of total output was from large mines, producing more than half a million tons per year.

³ In 1938 more than 30 per cent. of total output was from large mines, producing more than half a million tons per year.

OUTPUT OF ELECTRIC POWER (1937)

	Million kw.h.
U.S.S.R.	((1937) 36,400.0 ¹ (1938) 39,600.0
R.S.F.S.R.	23,787.2
Ukrainian S.S.R.	9,343.4
Byelorussian S.S.R.	430.4
Azerbaijan S.S.R.	1,390.9
Georgian S.S.R.	504.0
Armenian S.S.R.	265.5
Turkmen S.S.R.	57.1
Uzbek S.S.R.	276.2
Tadjik S.S.R.	28.1
Kazakh S.S.R.	288.3
Kirghiz	28.9

¹ 1913: 1945 million kw.h. In 1938, 75 per cent. of Soviet factories were using electricity as the main source of power.

PRODUCTION OF PEAT, IN MILLION TONS

1913	1938
1.7	26.5

PRODUCTION OF IRON AND STEEL, IN MILLION TONS

	1913	1935	1937-40
Iron ore . . .	9.21	26.84	(1938) 26.53 ¹
Manganese ore . .	1.24	2.38	(1938) 2.75
Chrome ore . . .	—	0.18	(1939) 1.02
Pig-iron . . .	4.22	12.49	(1940) 14.90 ²
Steel (ingots, etc.)	4.23	12.60	(1940) 18.40
Rolled steel . .	3.51	8.99	(1940) 12.80

¹ Including (in 1937) Magnitnaya Mountain (Urals) (6.5 million tons).

² Including (in 1936) Magnitogorsk (1.56 million tons), Kuznetsk (1.36 million tons), Kirov (Makeyevka) (1.32 million tons).

PRODUCTION OF IRON AND MANGANESE ORE, IN THOUSAND TONS

REGION	IRON ORE .		PERCENTAGE OF TOTAL (1938)	MANGANESE ORE		PERCENTAGE OF TOTAL (1937)
	1935	1938		1935	1937	
Karelia . . .						
Leningrad . . .						
Kalinin . . .						
Western . . .						
Moscow . . .	548.0	1,388.2	5.2			
Gorki . . .	3.7					
Ivanovo . . .						
Kirov . . .	9.4					
Kursk . . .	1.3					
Voronezh . . .	683.0					
Dnepropetrovsk } Ukraine . . .	16,549.4	16,069.9	60.6	1,037.0	956.9	35.0
Crimea . . .	456.0	852.1	3.2	—	—	—
Caucasus . . .	—	—	—	1,180.0	1,650.4	57.0
Orenburg . . .	56.2					
Sverdlovsk . . .	1,565.5			9.5	—	—
Chelyabinsk . . .	6,062.8	7,729.1	29.2			
Bashkir Republic . .	136.7					
West Siberia . . .	766.4	490.4	1.8	27.0	79.1	5.0
East Siberia . . .	6.6			131.1	65.6 ¹	2.0
Uzbekistan . . .	7.0	—				
U.S.S.R. . . .	26,845.0 ²	26,529.7	—	2,384.6 ³	2,752.0	—

¹ Krasnoyarsk district.

² 1913: 9.21 million tons.

³ 1913: 1.24 million tons.

PRODUCTION OF IRON AND STEEL, IN THOUSAND TONS

(The bracketed figures show percentages of total productions.)

REGION ¹	PIG-IRON			STEEL		
	1913	1935	1937	1913	1934	1937
	<i>Central District</i>					
Volga	—	—	—	—	—	1,232.0 (6.7)
Byelorussia	—	—	—	—	—	2.6 (—)
Western Region (including Byelorussia)	—	—	—	—	72.6 (0.9)	—
Finno-Karelia	—	—	—	—	8.4 (0.1)	—
Leningrad	—	—	—	—	420.4 (4.3)	—
Kalinin	—	—	—	—	7.8 (0.1)	—
Moscow	—	285.4 (2.3)	—	—	313.9 (3.2)	—
Gorki	—	31.2 (0.3)	—	—	361.1 (3.7)	—
Ivanovo	—	—	—	—	8.3 (0.1)	—
Kirov	—	6.9 (0.1)	—	—	199.0 (2.0)	—
Voronezh	—	421.9 (3.4)	600.0	—	6.6 (0.1)	—
Tula	—	—	500.0	—	—	—
Saratov	—	—	—	—	(—) 2.9 (—)	—
Stalingrad	—	—	—	—	544.5 (5.6)	—
CENTRAL DISTRICT	209.5 (5.0)	745.4 (6.1)	1,167.3 (8.0)	611.8 (14.5)	1,945.5 (20.1)	3,291.0 (17.9)
	<i>Southern District</i>					
Ukraine	2,882.5 (68.4)	7,623.5 (61.0)	8,800.8 (60.7)	—	4,683.6 ² (48.3)	8,466.7 (48.0)
Northern Caucasus and Crimea	222.4 (5.2)	—	414.8 (2.9)	—	—	826.2 (4.5)
Crimea	—	437.0 (3.5)	400.0 (2.7)	—	203.7 (2.1)	—
Azov-Black Sea	—	27.8 (0.2)	—	—	342.8 (3.5)	—
Transcaucasus: Azerbaijan	—	—	—	—	26.7 (0.3)	17.9 (0.1)
Georgia	—	—	—	—	—	0.6 (—)
SOUTHERN DISTRICT	3,104.9 (73.6)	8,088.3 (64.7)	9,215.6 (63.6)	2,712.6 (64.1)	5,256.8 (54.2)	9,311.4 (52.6)

¹ Corresponding figures for each year in the various regions were not available in many cases. In some instances this is due to changes in the boundaries.² Of this amount, 2,665.2 and 4,683.6 thousand tons were produced in the Donetsk and Dnepropetrovsk regions respectively.

PRODUCTION OF IRON AND STEEL, IN THOUSAND TONS (*contd.*)

(The bracketed figures show percentages of total productions.)

REGION ¹	PIG-IRON			STEEL		
	1913	1935	1937	1913	1934	1937
	<i>Eastern District</i>					
Urals	901.7 (21.4)	2,418.5 (19.3)	2,633.2 (18.2)	—	—	3,487.9 (19.1)
Sverdlovsk	—	838.1 (6.7)	600.0 (4.1)	—	1,057.8 (10.9)	—
Chelyabinsk	178.7 (4.3)	1,512.1 (12.1)	1,754.6 (12.1)	—	700.2 (7.2)	—
Perm.	—	—	150.0 (1.1)	—	—	—
Bashkir Republic . .	—	68.3 (0.5)	—	—	92.7 (1.0)	—
Siberia	—	—	1,471.3 (10.2)	—	—	1,631.6 (9.0)
Western Siberia . . .	—	1,233.9 (9.9)	—	—	629.2 (6.5)	—
Eastern Siberia . . .	—	2.8 (—)	—	—	9.2 (0.1)	—
Uzbekistan	—	—	—	—	1.8 (—)	7.9 (—)
EASTERN DISTRICT . .	901.7 (21.4)	3,655.2 (29.2)	4,104.5 (28.3)	906.6 (21.4)	2,490.9 (25.7)	5,127.4 (26.1)
U.S.S.R.	4,216.1	12,488.9	14,487.4	4,231.0	9,693.2 (1935) 12,600.0	17,729.8

¹ Corresponding figures for each year in the various regions were not available in many cases. In some instances this is due to changes in the boundaries.

PRODUCTION OF NON-FERROUS METALS

METAL	POSITION IN WORLD PRODUC- TION	1938-40	1913
		<i>Tons</i>	<i>Tons</i>
Bauxite (ore)	—	(1938) 246,000	—
Aluminium	3	(1940) 54,900	—
Copper	6	(1940) 166,200	31,000
Zinc or spelter	6	(1938) 80,000	—
Lead	9	(1938) 44,000	—
		<i>Million Troy Oz.</i>	<i>Million Troy Oz.</i>
Gold	4	(1939) 4.5	1.6

PRODUCTION OF PHOSPHATES (1938), IN MILLION TONS

	POSITION IN WORLD PRODUC- TION	1938	1913
Natural superphos- phates	2	1.57 ¹	0.063
Phosphates of lime	5	1.25 (1936)	—

¹ Total natural phosphates about 3 million tons; apatite 1.57 millions.

INDUSTRIAL OUTPUT

PRODUCT	POSITION IN WORLD PRODUC- TION	1938	1913
		<i>Units</i>	<i>Units</i>
Metal-working lathes	2 ¹	53,900	1,500
Locomotives	—	1,626	418
Tractors (caterpillar)	2	72,800 ²	0
Combine-harvesters ²	1	64,800	0
Motor-cars	6	211,400	0
Motor-lorries	2	184,400	0
		<i>Million Yards</i>	<i>Million Yards</i>
Cotton cloth	—	3817.8	2444.0
Silk cloth	—	64.4	14.2
Linen cloth	—	297.7	193.3 ³
Woollen cloth	—	124.7	110.0
		<i>Tons</i>	<i>Tons</i>
Paper	—	834,100	197,000

¹ For construction of all types of machinery.

² For grain.

³ Unbleached.

PRODUCTION OF PAPER, IN THOUSAND TONS (1937)

REGION	PRODUCTION	PERCENTAGE OF TOTAL OUTPUT
Northern (European)	92.2	11.1
North-west	296.2	35.6
Central	204.7	24.6
Volga	10.8	1.26
Urals	117.7	14.2
North Caucasus	17.9	2.16
West Siberian	1.1	0.13
Ukraine	28.4	3.42
Byelorussia	57.1	6.87
Georgia	2.9	0.35
Uzbekistan	2.6	0.31
U.S.S.R.	831.6	—

PRODUCTION OF GRANULATED SUGAR, IN THOUSAND TONS (1937)

REGION	PRODUCTION	PERCENTAGE OF TOTAL OUTPUT
U.S.S.R.	2377.5 ¹	—
R.S.F.S.R.	507.7	21.35
Central	414.2	17.42
Volga	8.8	0.37
North Caucasus	33.3	1.40
West Siberia	48.0	2.02
Ukraine	1757.6	73.93
Georgia	16.0	0.67
Kazakhstan	42.4	1.79
Kirghizia	53.8	2.26
Far East	3.2	0.14

¹ 1913: 1325.6; 1938: 2519.5.

PRODUCTION OF COTTON CLOTH AND LEATHER FOOTWEAR

REGION	PERCENTAGE OF TOTAL PRODUCTION (1937)	
	COTTON CLOTH	LEATHER FOOTWEAR
Northern (European)	—	0·41
North-western „	14·05	24·36
Central „	80·05	24·96
Volga „	0·58	6·39
Northern Caucasus (with Crimea)	0·22	10·26
Urals	—	2·44
Ukraine	0·20	17·07
Byelorussia	0·27	4·41
Azerbaijan	1·17	0·76
Georgia	—	2·98
Armenia	0·51	0·30
Turkmenistan	0·18	0·13
Uzbekistan	1·78	1·85
Tadjikistan	—	0·08
Kazakhstan	—	0·39
Kirghizia	—	0·07
Western Siberia	0·54	2·13
Eastern Siberia	—	0·89
Far East	—	0·12
Total percentage for R.S.F.S.R.	95·89	71·96
U.S.S.R. (Total production)	3817·80 million yards (1938)	About 200 million pairs (1938)

Approximate production of minerals not shown above, with percentage of, and position in, world production (1938), in tons: Aluminium, 56,800 (40 per cent., second); Barium, 120,000 (12 per cent.); Fluorspar, 60,000 (15 per cent.); Graphite, 82,000 (39 per cent.); Lead, 44,000 (3 per cent., ninth); Magnesite, 80,000 (37 per cent., first); Mercury, 280 (71 per cent., fourth); Mica, 8,000 (23 per cent., second); Nickel, 2500 (second); Potash, 180,000 (7 per cent., fourth); Salt, 4 million (13 per cent., second); Pyrites, 750,000 (9 per cent., fifth); Silver, 5 million troy oz. (2 per cent., second); Platinum, 137,000 troy oz. (38 per cent., first).

See *Minerals in Industry*, by W. R. Jones (Pelican Books).

Material for the tables of agricultural and industrial production has been obtained from *Socialist Construction in the U.S.S.R.* (Moscow, 1936 and 1939), the *League of Nations Statistical Year-book*, *Whitaker's Almanack*, and the *International Review of Agriculture* (International Institute of Agriculture, Rome).

PART TWO

REGIONAL GEOGRAPHY

CHAPTER VIII

The Lands of the North

GENERAL SURVEY

THE northern lands of the U.S.S.R. are contained within the Tundra and coniferous forest zones (see Chapters II-IV). For most practical purposes the Tundra may be considered as a desert area, with a very small population, a large proportion of which inhabits the southern edge of the zone, half-way between the Tundra proper and the coniferous forests. Therefore we shall not examine this zone separately, but it will enter into the description of the life of some of the peoples living in the north of the coniferous forest zone.

The physical divisions of the northern lands have already been considered in Chapter I. We have also examined the most important climatic features—the general decrease in summer temperature from south to north, and a decrease in both precipitation and January temperatures from west to east. These variations in the climate combine with differences in relief, so that the type of tree, and the thickness of forest growth, is not everywhere the same.

Between Central Karelia and the eastern bank of the river Yenesei the average January temperature decreases from 16° F. to — 20° F. along the same line of latitude. The July average is practically the same—about 60° F. Hence the average annual range increases from 25° F. to 80° F. Over the same area annual precipitation decreases from 20 inches to 12 inches. Thus in Western Siberia the low level of the land and the relatively high precipitation result in the formation of immense areas of swamp and dense thickets, in which the willow and alder are the principal trees. Forest is found

on the better-drained ground, and as it favours damper surroundings than other coniferous trees, the spruce is very common. In contrast to this region the Central Siberian Plateau, being higher and well drained, and experiencing a much lower precipitation, is thickly forested in those areas which are not above the limit of the growth of trees, and the larch is the dominant type of tree, with the Scots pine flourishing on the lower slopes of the hills. Towards the south of the coniferous forest zone the fir is to be found almost everywhere, while along the southern borders of Western Siberia there is a very definite area in which the birch predominates.

Along the valleys of the great Siberian rivers there are extensive meadowlands, of far greater extent than are to be found along the banks of the north-flowing rivers west of the Urals.

It is very important to know the type of tree which grows in each part of the forests when plans are being made for the development of the lumber industry in a particular area. It has been found that this knowledge can be gained by survey from the air, and this system of estimating forest resources is now widely used in the U.S.S.R. By this method directions are given as to which areas of timber are the most valuable and should be cut, and which areas should be avoided.

Towards the north the character of the tree-cover is seen to change gradually. As observed from an aeroplane, the thick dark green carpet which seems to cover the earth below gradually becomes a carpet with large holes in it. Patches of grey and yellow appear—the earth and moss of the Tundra, and the green carpet appears to become threadbare as the trees thin out and become smaller.

In the Far North small dwarf birches are commonly seen, and in some cases these trees are only a few feet in height, although they may be as much as two hundred years old.

Obviously agriculture is restricted by the severity of the winter and the short length of the growing season. Conditions are most favourable for plant growth towards the south. But it must be remembered that over large areas of the forest

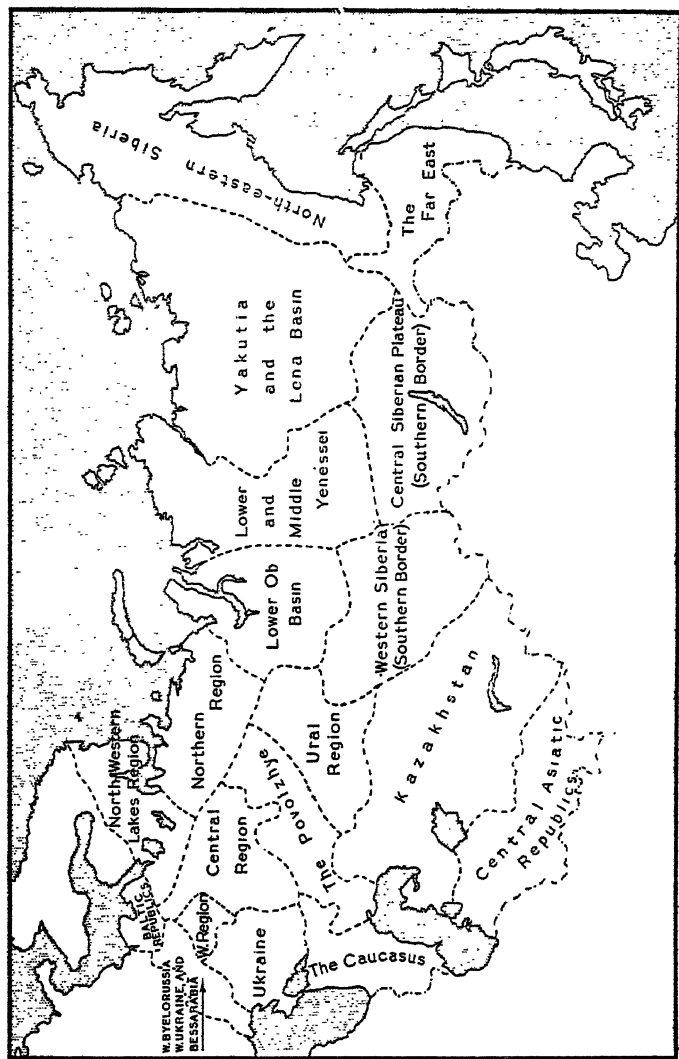


FIG. 28. GENERALIZED BOUNDARIES OF THE ECONOMIC REGIONS OF THE U.S.S.R.

lands, in spite of the severe winter, the summer is extremely warm, and partly owing to the long hours of sunlight, plant life seems to go forward with great intensity during June, July, and August. One traveller aptly described the Siberian climate thus: "There is the Siberia of snow and ice, and the Siberia of blood heat."

The possibilities of agriculture vary according to soils and local climatic conditions in exactly the same way as the forest growth varies. The damper climate and the cold, glacial soils of the west are less favourable to the growth of crops than some of the higher and better-drained land east of the Yenesei, where the ripening of rye and barley is assisted by the drier and less cloudy summers, while along the southern edge of the Central Siberian Plateau the south-facing slopes of the hills provide excellent summer pastures for the herds of the nomadic Buryat-Mongol peoples.

Within recent years the application of scientific technique to agriculture has proved that certain crops can be grown far to the north, even within the Arctic Circle. The severe climate and the poor podsol soils certainly provide the farmer with numerous difficulties. But it is now an established fact that the native peoples, the men in the lumber camps, and the workers in the mines and at the newly developed Arctic ports can be assured of a regular supply of essential foods from local resources. Rye, hay, vegetables, and potatoes are now grown in areas where, only a few years ago, the reindeer and fish were the only food resources available.

Life and Work in the Lands of the North

The native population is divided into about twenty-six national groups, each with its own language and customs (see Chapter VI). Some live mainly by hunting and fishing, while others keep herds of reindeer. The Yakuts, in the Far East, who are now rapidly developing agriculture in their forested country, have for long kept small herds of cattle on the meadowlands near the rivers. Until the Soviet Government reorganized the economy of the north, the main items of food

were everywhere practically the same—meat and fish, with the addition of wild berries during the summer. Clothes and summer tents were frequently made from the skin of the reindeer. Certain tribes constructed a summer dwelling by covering a framework of poles with earth and grass and brushwood. Winter dwellings were even more primitive, often resembling dugouts, being built half below the ground-level, in order to keep out the cold. The upper portion consisted of a wooden frame, with a covering of earth and brushwood to fill in the open spaces, and in the autumn water and mud were poured over the outside so that the whole mass became frozen into a solid wall.

In parts of the Far North there is not sufficient food for the reindeer, so that many tribes use teams of dogs to draw the sledges. The dogs are fed on fish. Some native peoples hunt on foot. The Yakuts frequently ride on the back of the deer. Along the Arctic coast walrus and seals were hunted in the past from small canoes, but now to an increasing extent with motor-boats and modern equipment. Both native canoes and sledges are examples of rare ingenuity and craftsmanship. The sledge, for example, is constructed without the use of a single nail. The various parts are bound together by means of leather thongs, and should one part break it can be quickly removed and replaced. The canoe or wooden boat is essential for travel during the summer, when the rivers are the only roads available, just as the sledge is indispensable during the winter.

Since the arrival of the first trader the habits and customs of the native peoples have been considerably modified. When left entirely to nature, the native had his time fully occupied with maintaining a supply of food, and a supply of wood to heat his simple house. Food shortage was in the past a frequent occurrence during the winter, when the reindeer often died from starvation owing to lack of fodder. The death-rate among children was high, because there was no adequate medical care for them in their early years, and the food available was restricted. Traders introduced many diseases which were previously unknown.

The Soviet Government is doing a great deal to assist these peoples and to save them from complete extinction. State reindeer farms are proving their superiority over the nomadic form of reindeer-breeding. The use of better types of nets for fishing, and of the motor-boat in place of the canoe, are becoming more common. The native is being shown that he can increase the variety and quantity of his food by growing potatoes and vegetables and keeping cattle on the meadowlands.

The Russian wooden house, and the settled way of life, are slowly finding favour, and as the younger generation of natives now goes to school, and the more intelligent pupils are sent to study at the Institute of the Peoples of the North, in Leningrad, the number of native doctors, teachers, agricultural and animal-breeding specialists, veterinary surgeons, and so on, is increasing. The Russians hope that in the future these peoples will be able to play a great part in developing the great wealth of minerals and timber which their lands possess.

Special Problems of the North

The coniferous forest lands are rich in timber, furs, gold, and other minerals. The Arctic waters and the rivers abound in seal, walrus, and fish. But the climate places a severe handicap upon the utilization of these resources. The food supply is limited, and consequently the population is sparse, and even with the introduction of more modern ways of life the lack of labour is a problem which it is not easy to solve.

The second great problem is that of transport. Over vast areas there are neither roads nor railways. West of the river Yenesei, particularly, the thickets and swamps near the rivers often make travel impossible except during the winter, when the marshes are frozen. That is why the population is concentrated near to the rivers, in places where there are no swamps, for along the waterways movement and communication is at least possible during the summer months. But even when timber and furs can be carried along the great rivers,

either to the north or south, there is still the problem of lateral movement to the west, to the populated centres of Europe where these products are required. Until recent years there was only one way to the west—the Trans-Siberian Railway. But railway transport across hundreds of miles of land is extremely expensive. Consequently the wealth of Siberia and of much of the north of European Russia remained for centuries almost untouched.

During the past twenty years great efforts have been made to solve these problems. We have already mentioned the introduction of agriculture to the north, and although wheat will always have to be imported there is now no doubt that considerable numbers of people engaged in mining, lumbering, hunting, or fishing, can be provided from local resources with much of the food which they require. One collective farm in the Yakut Republic, for example, produced a yield of 22 tons of cabbage per acre in 1938. The average annual temperature at this farm is 16° F.

Finally, regular air-services have been introduced, and the problem of heavy freight transport has been solved by the opening of the Arctic Ocean for merchant shipping during the summer months. Details of this new northern sea-route will be given in a later chapter. For several years past convoys have been passing through the Arctic with the aid of icebreakers, taking away timber and furs and fish from the new Arctic ports and bringing to the peoples of these lands all the various commodities which in the past it was so difficult for them to buy. The Russians now consider that the use of the great Siberian rivers, together with the Arctic Ocean, has to a great extent solved the problem of transport for the northern lands. The development of the northern sea-route, and the fisheries, mineral, timber, and fur resources, is in the hands of the Central Board of the Northern Sea Route, which is also responsible for the development of educational and cultural work among the native peoples. The Institute of the Peoples of the Far North has already done much in the preparation of text-books, and the provision of medical and educational amenities.

THE NORTH-WESTERN LAKES REGION

The Leningrad Region and the Finno-Karelian Republic—the land lying roughly between Leningrad and Murmansk—can be conveniently treated as a single region (see Fig. 29).

With the exception of the land immediately to the south of Leningrad the whole area lies upon the pre-Cambrian Shield, a rigid platform of old, hard, crystalline rocks, worn down to a peneplain in early times, and remaining for a very long period unfolded and above sea-level. During the Great Ice Age, however, the advancing glaciers removed most of the soil cover, leaving large areas of bare rock in the north, while the retreating glaciers left a countryside strewn with moraines, boulders, sands, gravels, and clays in the centre and south. Owing to the low relief of the land, especially in the centre and south, the numerous hollows have remained filled with water, forming thousands of lakes, many of them interconnected by powerful streams, which possess considerable reserves of power. Some of the lakes, such as Lakes Ladoga and Onega, are of great size. The land is crossed by a great number of rivers and streams, and much of it is badly drained and swampy.

Lake Ladoga, with an area of 7230 square miles, is the largest lake in Europe. Its greatest depth is 780 feet. The northern shores are steep and rocky, the southern relatively flat. The lake drains an enormous area, and the streams which flow into it generally have a short, sharp fall from the watershed to the lake. Hence there are large reserves of hydro-electric power. Lake Ladoga is also an important link in the transport system of Finno-Karelia, being connected by the Svir river, about 140 miles long, to Lake Onega, and thence by the new Baltic-White Sea Canal to the White Sea. In 1936 the tonnage of freight carried across Lake Ladoga exceeded 329,000 tons, consisting mainly of cargoes of bulky and heavy materials, such as timber, wheat, oil, salt, and building materials.

Along the southern shores of the lake about 2000 people are engaged in the fishing industry.

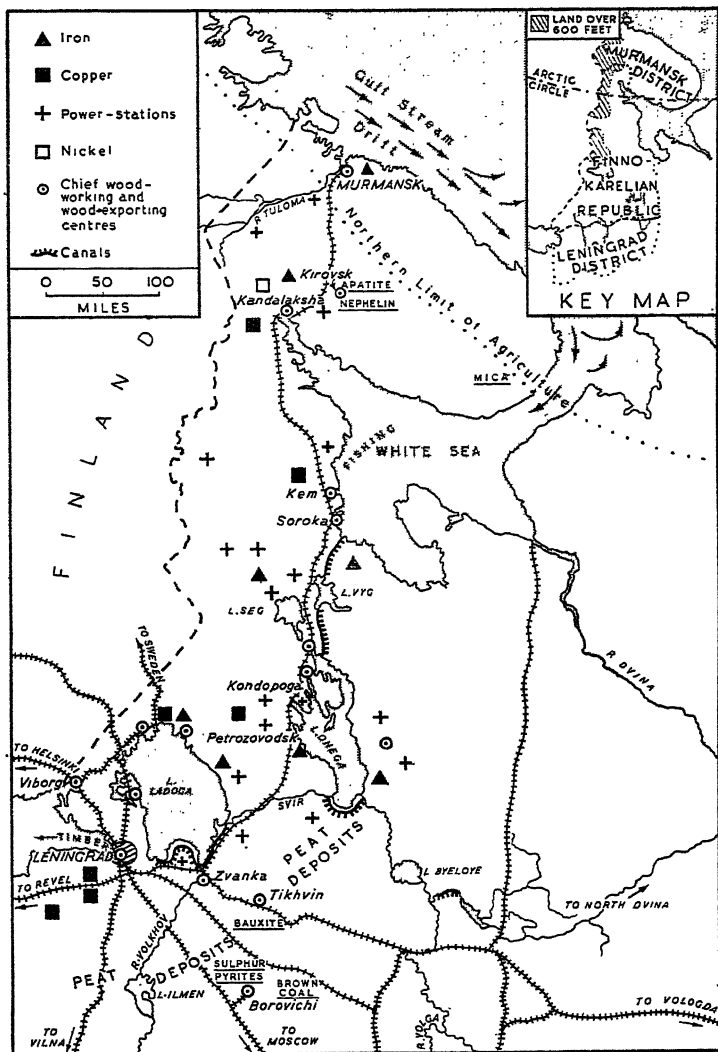


FIG. 29. THE NORTH-WESTERN LAKES REGION

Lake Onega is the second largest European lake. Its area is 3660 square miles and its greatest depth 1400 feet.

Towards the Finnish frontier in the west, and in the Khibin Mountains in the north, the land rises. The landscape is composed of smoothed and rounded elevations of no great height. Even the Khibin Mountains, the most notable extent of highland within the region, rise to little more than 4000 feet, and have been considerably denuded and the contours smoothed out.

This region, situated at the extreme north-west of the Russian Plain, is crossed by depressions or cyclones, which bring with them moist and relatively mild air from the Atlantic. The precipitation is consequently fairly heavy, while the winter temperatures are not so low as those experienced farther to the east. The warm waters of the Gulf Stream Drift wash the northern shores, keeping the port of Murmansk free from ice during the winter; while Leningrad and Archangel, both farther south, are icebound. For this reason each year, from December to May, Murmansk supercedes Leningrad as the chief Soviet port in Western Russia.

Another effect of the Gulf Stream Drift and the milder air which penetrates into the north-west is the narrowing of the Tundra zone to a very limited area along the northern coast. The remainder of the region is covered with coniferous forest and swamps. The poor soils and the cold, damp climate make agriculture extremely difficult, especially in the north. Consequently the population is sparse, and immense tracts of the country remain uninhabited. Leningrad stands out as a unique example of a city with a population of more than 3 millions standing like an island of people in a very thinly peopled region.

It is more easy to utilize the resources of this region than it is in most other areas of the coniferous forest lands, since it is served by two excellent ports—Leningrad to the south and Murmansk to the north. Furthermore, the two towns are connected by a railway line, while the south is served by the new Baltic-White Sea Canal. Thus the north-west is more conveniently situated from the point of view of the export of

timber and minerals, while Leningrad itself is the third most important industrial region of the Soviet Union, and as such is able to absorb a large proportion of the resources of the lands lying to the north.

Generally, therefore, the north-western lakes region may be described as a lowland of granites, lakes, swamps, and forests, possessing great mineral wealth and large resources of timber and water power, and not suffering from a lack of transport facilities or difficulty of access to either large industrial centres or the foreign market.

Occupations

Lumbering and the Associated Industries. More than three-fourths of the region is forested, so that the main occupations of the people are associated with the lumber industry. The Finno-Karelian Republic is the most important timber-producing area. A journey across the country by aeroplane reveals a landscape of dark green, broken here and there by the silver gleam of rivers and lakes, or the brighter green of meadows. Very occasionally it is possible to see a group of fields or a village. But large areas are quite unpopulated, and most of the lumber settlements lie close to the railway or to the rivers and the Baltic-White Sea Canal.

Much of the tree-felling is done during winter, when the logs are prepared for transport along the lakes and rivers as soon as the spring thaw comes. A large proportion of the work is now done by mechanical means. Trees are cut by motor-driven saws and hauled by powerful tractors along prepared ice roads. The men work in brigades and live in large wooden barracks, or log houses. Each lumber camp also has its co-operative store, school, and hospital, as well as a club where the men can spend their leisure hours.

The timber is floated down to saw-mills, usually situated at a point on the river where electric power can be obtained from rapids or a swiftly flowing current, and where there is convenient transport. Thus there are a number of saw-mills along the coast of the White Sea, and along the northern and western shores of Lake Ladoga. At Kondopoga, situated at

the point where the river Suna enters Lake Onega, and at Segezhs, there are large pulp, paper, and cellulose industries, which utilize the power from the river Suna hydro-electric station.

Kondopoga is the third largest producer of newsprint in the U.S.S.R., and in 1939 plans were made to increase the annual output of the industry to 65,000 tons. The capacity of the Segezhs plant is 70,000 tons of cellulose and 45,000 tons of paper.

About twenty-five miles from the saw-mills of Koivisto, a port on the Gulf of Finland, is a large cellulose-paper combine, while another, at Yoganessa, has the capacity to manufacture 40,000 tons of cellulose and 5000 tons of paper per year. The Pitkyantsk factory produces 40,000 tons of cellulose annually, the Ilkhevara combine 11,000 tons of paper and cellulose, while the Enso sulphate-cellulose works has a similar output. The great sulphate-cellulose enterprise at Sortvale, on the north shore of Lake Ladoga, and one of the largest ports on the lake, yields 100,000 tons of cellulose a year, and there are also saw-mills and two paper factories in the town. Keksholm, another town on the shores of the lake, has large saw-mills and an important cardboard-cellulose works.

Paper is also manufactured at Kandalaksha and at Petrozavodsk, where there is a large ski factory. In Leningrad there is an important match-making industry, in addition to numerous factories engaged in the manufacture of paper and wood products. Within the last ten years the export of matches has greatly increased.

About 14 per cent. of Soviet timber is derived from the forests of Karelia and the Leningrad region, and about 20 per cent. of the entire Soviet timber export is derived from the Finno-Karelian Republic. In 1939 13½ million cubic metres of timber were prepared for export. This was eight times the amount produced for export in 1912. The greater part of this is shipped through Leningrad. The transport of the timber from the forests has been greatly facilitated by the construction of the Baltic-White Sea Canal. The quays and wharves of the Port of Leningrad are stacked high with

timber. The work of loading the ships is almost entirely mechanized. Specially designed petrol-driven timber carriers carry heavy loads of planks to the waterside, where travelling overhead cranes load the ships. A smaller export is carried on through the White Sea ports of Kem and Soroka.

The importance of the timber industry to the Finno-Karelian Republic is clearly shown by the fact that more than 60 per cent. of the population is engaged in it.

Agriculture. The short, damp, cloudy growing season combines with the poor and badly drained forest podsol soils to hinder the development of agriculture. The land suffers from an excess of moisture and a lack of dry, sunny summer days. Thus, although the winters are not so severe as in the more eastern parts of the northern lands, and the winter snow cover gives the earth ample protection against the heavier frosts, the summer conditions are not favourable for the growth of cereals. But, except in the extreme north, it is possible to grow potatoes, vegetables, and in many cases oats and grass. In the south of Finno-Karelia and in the Leningrad Province rye and some flax are cultivated.¹

As elsewhere in the Soviet Union, the acreage of sown land has greatly increased during the last twenty years, and the mechanization of agriculture has proceeded rapidly. Special varieties of spring wheat were introduced in 1933. In the Petrovsk district yields of this crop as high as 13 cwt. per acre have been obtained. In 1913 6.3 cwt. of oats and 44.5 cwt. of potatoes was considered a good yield per acre. Within recent years, however, two of the best farms have raised their annual yield to 15.7 cwt. and 182.9 cwt. for oats and potatoes respectively. The greatest concentration of farms is in the neighbourhood of Leningrad, where there is a big demand for milk, potatoes, vegetables, and pigs to feed the urban population. Wheat is now also cultivated in the Leningrad region, and supplies are sufficient to meet the needs of the population.

¹ Flax is most important in the south-west, near Novgorod and Pskov, where cultivation is favoured by the damp climate, glacial clay soils, and a greater supply of labour than elsewhere in the north-west.

But it is obvious that since large tracts of land remain unpopulated, while a large proportion of the people is engaged in the lumber industry, the number of farms and agricultural villages is very small. In the Finno-Karelian Republic about 3 per cent. of the land is used for agricultural purposes, and most of this is natural meadow. Not more than 20 per cent. of the population is engaged in agriculture. The greater concentration of farms in the vicinity of Leningrad raises the percentage of agricultural land to 25, in the Leningrad region as a whole. About one-third of the arable land is devoted to grain crops, grown mainly for fodder.

In order to lower the cost of food, which tends to be high when brought into an area from regions which are far distant, the acreage of land devoted to farming has been considerably increased during recent years, and this has been accompanied by a corresponding increase in the number of cattle and pigs reared on the collective farms.

Attempts to push the limit of agriculture farther to the north have met with great success. This is of the greatest importance to the development of industry, for the workers in the mines and lumber camps require a constant supply of meat and vegetables if they are to maintain a good standard of health.

A large state farm near Kirovsk, in the Khibin Mountains, now produces vegetables for most of the Murmansk region. On the shore of the Kola Peninsula, near latitude 70° N., fishing stations have been established, and on one of the farms connected with these a yield of 8 tons of potatoes per acre has been obtained. This is due to the long hours of daylight experienced during the summer. In this way the long summer days compensate for the short length of the growing season. Another state farm in the Murmansk region harvested, in 1938, nearly 13,000 cwts. of vegetables, and 28,000 cwts. of potatoes. In addition to those grown in the open air, 436 tons of vegetables were produced in hothouses. Another achievement of agricultural science is the cultivation of substantial wheat crops just to the south of Leningrad. The northern limit of wheat cultivation for commercial

purposes was previously considered to be considerably more to the south.

A further increase in crop-production has been obtained by the utilization of large areas of marshland which have been drained, while the poor glacial soils of other areas are improved by the application of fertilizers. The development of the apatite mines near Kirovsk is of the greatest significance to northern agriculture, since excellent chemical fertilizers are manufactured from this mineral.

Deer-breeding, Hunting, and Fishing. The native peoples living on the borders of the forest and Tundra zones are small in number, and have been engaged in the past in hunting, fishing, and the herding of reindeer. In recent years state reindeer-farms have been established, in order to encourage the scientific breeding of reindeer. Hunting and trapping are not the most important occupations, but fishing is rapidly becoming one of the foremost industries. The rivers and lakes abound in fish, while along the northern coast, and in the White Sea, the relatively warm waters of the Gulf Stream Drift are rich in the microscopic plant and animal life upon which fish feed. Herring, cod, and other fish swarm in large numbers in these waters. Collective fishing stations have been set up along the coast, while Murmansk is the centre for a large trawl-fishing organization. At Kandalaksha there is a fish-canning industry.

Industry

Sources of Power. The absence of coal deposits in the north-western region has been largely responsible for the retarded state of the development of mineral resources in the past. This lack of power supplies has been overcome recently by the construction of a number of powerful hydro-electric stations on the rivers. In the Kola Peninsula there is the most northerly electric 'grid' transmission system in the world, connecting the river Tuloma power stations with those on the river Niva. The rivers make short but sharp descents from the higher land near the Finnish border to the coast, and to the lowland occupied by the lakes between the

White Sea and Lake Ladoga—the area occupied by the post-Quaternary Marine transgression, and since slightly elevated.

In the south hydro-electric stations have been constructed on the river Suna, which flows into Lake Onega, and on the Svir river, which joins this lake to Lake Ladoga. Another important source of power is the Volkhov river, flowing from Lake Ilmen into Lake Ladoga. Other hydro-electric stations are shown in Fig. 29.

The total power reserves of the Karelian rivers have been estimated at 10 million kw.h.—three times the power of the Dnieper. Twenty-four hydro-electric stations were operating in the Soviet Union in 1939, twenty of them constructed by the Soviet Government. Seven were built in Karelia and the Leningrad district.

The factories of Leningrad depend for their supply of power partly upon coal from the Donbas, far away to the south-east. The amount of coal transported over long distances is now being reduced to a large extent by the use of peat and combustible shales, obtained locally, in the place of coal, together with brown coal from the Borovichy mines to the east of Leningrad, and electric power from the hydro-electric stations mentioned above.

The Volkhov hydro-electric station, the first turbine of which came into operation in 1926, has a capacity of 66,000 kw. It is connected to Leningrad by a high-voltage transmission line, and has been instrumental in saving the transport of some 200,000 tons of coal per year to the city. Now, however, it is a reserve station for Leningrad, the power being diverted to the aluminium industry, which has been established near by, and Leningrad is supplied by the Svir hydro-electric station, constructed more recently.

Of the power stations in Leningrad itself one is operated entirely on peat, a fuel which is being used increasingly in Finno-Karelia. The turf deposits of this region—30 million cubic metres altogether—attain a thickness of 30 to 40 feet in many places. Another fuel is shungite. Immense deposits occur around the shores of Lake Onega. Although the thermal output per unit of fuel is low, and when burned it

gives up to 45 per cent. of ash, it is economical to use because the ashes yield metallic vanadium, aluminium oxide, and other valuable minerals.

Transport. The successful utilization of mineral or timber resources requires not only power, but transport. It is expensive to convey heavy loads of timber or minerals over long distances by rail. Before 1917 there was not even through railway connexion between Murmansk and Leningrad. The present line had been commenced, but was completed by the Soviet Government.¹ The line was soon overloaded, and proved quite inadequate to cope with the requirements of the region. In order to relieve the railway of some of the heavier traffic the Baltic-White Sea Canal was built. A system of deepened water-courses and canals connecting the lakes which lie to the north of Leningrad enables merchant ships to make a through passage from the Gulf of Finland to the northern end of Lake Onega. Here the new canal joins the latter lake with Lake Vyg, and a final section connects this lake with the White Sea at the terminal port of Soroka. The total distance from the Lake Onega port of Povonyets to Soroka is 140 miles. The importance of this canal may be gauged from the reduction of time which it has effected in the transportation of heavy cargoes from White Sea ports to the port of Leningrad. Prior to the construction of the canal the journey had to be made by sea around the northern and western coasts of Scandinavia. It occupied seventeen days. By canal the journey takes only six days.

Heavy materials such as apatite, nepheline, timber, granite and building stone can now be shipped direct to Leningrad from the north, supplying the city with valuable raw materials for its industries and its export trade.

In time of war the canal may be used for the movement of certain units of the Soviet Fleet, should the Baltic Sea be subject to blockade.

Medvedzhogorsk (population 12,000) is a new city, built only a few years ago. It is the centre of the Baltic-White Sea Combine. Where the Baltic-White Sea Canal enters the

¹ The Kandalaksha-Murmansk section is now electrified.

White Sea Soroka has been replaced by the new port of Byelomorsk.

Finally, it should be noted that the early portages mentioned in Chapter I were replaced at a later date by shallow canals. Within the last ten years these have been widened and deepened, so that there are now through waterways of commercial importance from Leningrad to both the North Dvina and the Volga rivers. When the projected canal system has been completed there will be a further connexion between the Volga and the Dnieper, so that Leningrad will be in direct communication by water with the White Sea, the Black Sea, and the Caspian. In addition to new canals and railways more than 5000 miles of new motor-roads have been constructed in Finno-Karelia during the last twenty years.

The Northern Industrial Region. One of the most recently developed industrial regions of the Soviet Union is to be found in the Lake Imandra area of the Kola Peninsula, near to the Khibin Mountains. These mountains possess rich deposits of apatite, from which mineral fertilizers are manufactured, and nepheline, from which aluminium can be produced. In the hills around Lake Imandra copper,¹ nickel, and iron are mined, while in the east of the Kola Peninsula there are important deposits of mica.

In the Khibin Mountains an entirely new town, Kirovsk, has been constructed. Its population of 150,000 is chiefly engaged in the mining of apatite and nepheline and in the manufacture of fertilizers. To the south, situated on the Niva river, near to the point where it enters the White Sea, is the town of Kandalaksha. Aluminium is produced here, and there is also a large fish-canning industry.

Shipments of fertilizers and minerals can be made from Kandalaksha either by rail or by ship through the White Sea and the Baltic-White Sea Canal to the south, or by rail to Murmansk.

Murmansk is the largest port of the north. In addition to being the centre of the fishing-fleet, it possesses large fish-

¹ Mines have been opened here recently, to supply the large copper-nickel Combine at the new town of Monchegorsk (30,000).

refrigeration plants and a cannery. It is also an important point for the export trade of the Kola Peninsula.

The entire industrial development of the region depends upon the supplies of hydro-electric power derived from the power stations mentioned above.

The Southern Industrial Region. Mention has already been made of the paper and cellulose industry at Kondopoga. Still farther to the south there is a small industrial region around the town of Borovichi, in the Leningrad Region, where brown coal, sawn-timber, ceramics, and paper are produced. At Tikhvin are the most important deposits of bauxite in the whole of the U.S.S.R. At Zvanka, on the Volkhov river, this mineral is used for the manufacture of aluminium. The Zvanka works is the largest in Europe, producing 20,000 tons of aluminium per year. The large amount of electric power needed for this process is obtained from the Volkhov hydro-electric station.

Lake iron ore deposits are known to exist around all the large lakes of the Finno-Karelian Republic, and those of Lake Vyg are considered to possess reserves of over 11 million tons. Pitkyranta, on the north shores of the lake, is a centre for metallurgical industries. When the lake iron resources are fully utilized Leningrad will be independent of supplies of iron ore which at present are brought from the Urals. Iron has also been mined near Petrozavodsk since the time of Peter the Great. It is found in rich magnetite veins, and supplied the early armaments industry of Russia at a time when the Russian State was rapidly expanding. Petrozavodsk means, in the Russian language, "Peter's Mill," or "Peter's Factory." It was the only industrial town of the north-western region in Tsarist Russia. To the north lay some of the wildest and most sparsely populated areas of the whole country. So remote was the Kola Peninsula, for example, that Kandalaksha was a settlement chiefly populated by escaped convicts, who felt that here at least they would not be discovered and sent back to prison. The name of the town is itself significant, for the Russian word 'kandali' means 'fetters.'

Petrozavodsk (69,000), founded nearly 240 years ago, is to-day an important centre of the wood industry and for the manufacture of high-quality steels, machinery, and gas-generators for tractors. More than 6 million roubles' worth of mica are produced annually.

Viborg is an important town situated on a small peninsula and a few islands on the shallow Viborg Bay. Founded at the end of the thirteenth century, it was for long used as a base in the Swedish wars against Russia, until in 1710 it was seized by Peter the Great. It has a fairly good harbour, lying close to a useful system of inland waterways, and the great coniferous forest belt. In 1856 the forested Saima basin, which contains excellent timber, was connected with Viborg by means of a canal, about 35 miles long. The canal is used for the floating of timber, and serves the cellulose, paper, and other industries of the area. In 1870 Viborg was linked to St Petersburg and Helsinki by railway. To-day it has a population of 82,000 and is an important wood-exporting port. The town contains flour-mills, tobacco factories, and engineering works, and is of great strategic influence for the defence of Leningrad and the Gulf of Finland. The port is closed by ice from December to April, and owing to the shallow water the port of Uraz (about 8 miles away) takes a larger share of the trade of Viborg's hinterland.

The Industrial Centre of Leningrad. Leningrad, in addition to being the chief western port of the Soviet Union, is also the third most important industrial region of the entire U.S.S.R. Its great population derives practically none of the natural resources which support the industries of the city from the lands of the north-west. Leningrad is truly a city of a special type. We have already noticed in Chapter V that in its early days the Russian State possessed no port through which trade could be carried on with other countries. The Baltic was the obvious way out to the great international lanes of commerce. But for long trade had to be carried on through Novgorod, a town which was then in the Hanseatic League. Sweden controlled the shores of the Gulf of Finland. Peter the Great made war upon the Swedes for the purpose

of gaining control of the Gulf, and built his new capital, St Petersburg, upon the marshes of the islands of the Neva Delta. The system of portages connecting the Gulf of Finland with the Volga and the Dnieper was replaced by canals, and for nearly two centuries large cargoes of grain, timber, hemp, and flax flowed along the waterways from the Caspian Sea to the Baltic. Coal and iron and jute were imported, and Russia's own coal and iron were carried in barges from the Urals and the Donbas. St Petersburg became the focal point of Russian trade and commerce. The city attracted everything towards it, and although it was without resources of its own, it was possible to build up within the city a series of great industries. To-day it is no longer the metropolis of the Soviet Union, but this great port, now named Leningrad, produces nearly one-quarter of the industrial output of the U.S.S.R.

It was said of St Petersburg that its industry was founded upon English coal and iron and Russian cotton and wool. But during the last twenty years even the carriage of Russian coal from the Donbas (the foreign imports having ceased) has been considerably reduced, since peat and combustible slates, together with the water-power derived from the rivers, are producing on an ever-increasing scale the electricity which drives Leningrad's factories.¹

The paper and cellulose industry has already been mentioned. More than 30 per cent. of all Russian paper is manufactured in the north-western lakes region, and a large proportion of the industry is concentrated in Leningrad.

The fertilizer industry, dependent upon the apatite from the Khibin Mountains, is of great importance, as is the chemical industry.

Engineering is also a major occupation. The skill of the engineers of the city is highly esteemed throughout the U.S.S.R. For nearly a century this industry has developed, and to-day Leningrad is a most important centre for machine-building, the making of electric motors, scientific instruments, machine tools, and so on. When the first steps were being

¹ In 1937 about one-half of the fuel used came from the Donetz coal-field, and one-sixth from the Caucasian oil-wells.

taken during the last twenty years to build up Soviet industry the first models of motor-cars, tractors, and various new types of machines were designed and constructed in the first place in Leningrad, before being mass-produced in the centres of heavy industry elsewhere in the Soviet Union.

The textile industry still occupies a prominent position, more than 10 per cent. of the entire cotton cloth production of the U.S.S.R. originating in the mills of the city. Here also is one of the largest plants for the production of synthetic rubber, an industry of particular importance to a country which possesses no resources of tropical rubber.

Finally, Leningrad is one of the largest centres of the Russian shipbuilding industry, and the largest Soviet port.

In a later chapter the importance of the northern sea-route to the northern lands will be discussed. The administration of this organization, as well as that of many new projects in Northern Siberia, is situated in Leningrad, which in many respects may be regarded as the capital of the northern lands.

Population

The population of the Finno-Karelian Republic is composed almost equally of Finnish and Karelian peoples and Russians. The Karelians and Finns are found mainly in the west and south-west, the Russians in the east and south-east, especially around the shores of Lakes Ladoga and Onega.

The Finns are not a large minority, although their number has been increased since new territory was added to the Soviet Union at the conclusion of the Soviet-Finnish War. The Karelians work mainly in the lumber industry. The Murmansk district forms part of the Leningrad Region for administrative purposes. But in both areas the greater part of the population is urban, and concentrated in the three large towns. The statistics given below illustrate clearly how thinly the people are spread over the Kola Peninsula. Throughout this large area there is a population of little more than 45,000. The figures for the Leningrad district, however, are the most outstanding. It will be seen that

almost one-half of the entire population of the district is concentrated in the city of Leningrad.

Population Statistics (1939)

Murmansk District

Urban population .	245,371	Murmansk . .	117,054
Rural population .	45,817	Kirovsk . .	128,000
Total population .	291,188		

Karelian A.S.S.R. (prior to the formation of the new Finno-Karelian Republic)

Urban population .	150,440	Petrozavodsk .	69,728
Rural population .	318,705		
Total population .	469,140	(60 per cent. Russian, 40 per cent. Karelians and Finns)	

Leningrad Region

Urban population .	4,119,230	Leningrad . .	3,191,304
Rural population .	2,315,846		
Total population .	6,435,076	(90 per cent. Russian, 10 per cent. Finns, Estonians, Jews)	

THE NORTHERN REGION

(See Fig. 30)

The northern region consists of an extremely level lowland, divided into a western portion—the basin of the North Dvina—and an eastern portion—the Pechora basin, by the Timan relic mountains (see Chapter I). The low relief of the land has made possible the construction of canals between the North Dvina, the Volga basin, the Neva, and the Kama, while across the low, broken ridges of the Timan system there are easy portages.

The North Dvina and Pechora rivers and several of their tributaries are navigable by river steamers for several hundred miles. The lower course of the Dvina is from two to three miles in width.

The whole region is bounded on the west by the ancient White Sea-Ladoga-Onega Gulf, and on the east by the Urals. It extends in the south for a little way across the watershed between the north-flowing and south-flowing rivers.

Owing to the low level of the plain, which is covered with glacial clays, there are large areas of uninhabited swamp and bog.

Climate and Vegetation

The climate is severe. The January average temperature decreases from 10° F. in the west to 6° F. in the east. The winters are long, with more than 200 days of frost. Snow remains on the ground for about 160 days in the south and 200 days in the north. The summers are short but warm, with July average temperatures rising from 50° F. in the north to 64.5° F. in the south. In the far north the sun does not set during the months of June and July, while elsewhere there are 'white nights,' during which there is no real darkness.

Navigation on the North Dvina begins at the end of April and continues until the end of September. But the mouth of the Pechora is often blocked by ice even in May. Thus the short summer season is very busy, for during this period timber has to be floated down to the saw-mills, while grain is shipped into the region from the Volga, and from Siberia.

Cyclones bring relatively mild and damp air from the Atlantic, so that the precipitation is higher than in Central Siberia. Cloudy weather is common, and there is rain during summer. Precipitation is particularly heavy in the south-western corner of the region, where it reaches 20 inches annually, as compared with 12 to 16 inches in the centre and 8 to 12 inches in the north. The influence of the milder and damper Atlantic air in this part of the coniferous forest zone is reflected in the northward extension of the forests to the west of the river Mezen, where the Tundra zone is completely absent. Towards the east the Tundra zone broadens out as the climate becomes more severe. Everywhere, even in the towns, wooden houses and buildings predominate, and even roads and pavements are made from timber.

Of the territory of the northern region, 3 per cent. is cultivated, 20 per cent. Tundra, and 77 per cent. is occupied by vast forests, through which flow four great rivers, used for floating the logs to the ports, where they are sawn and exported, or sent to the pulping and wood-working mills.

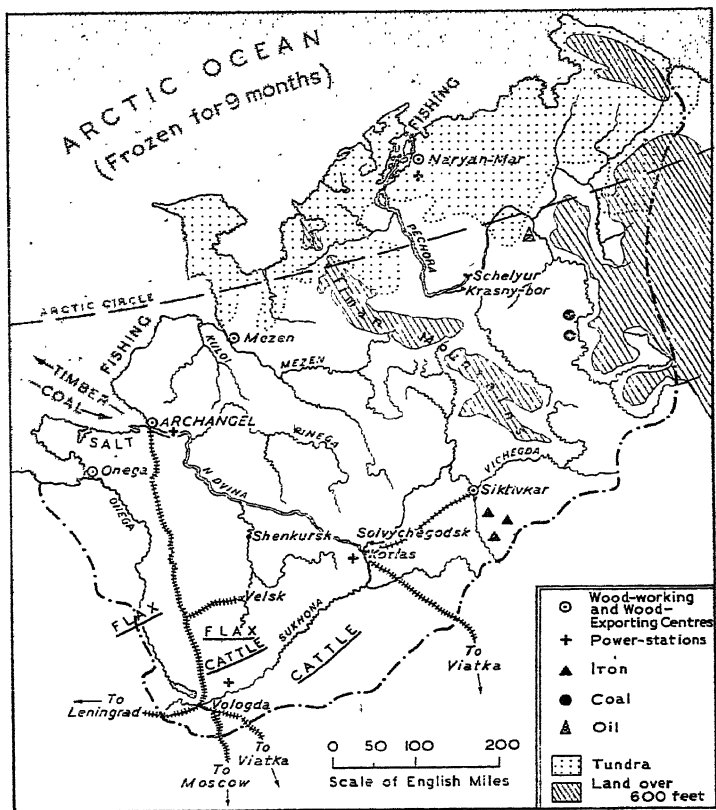


FIG. 30. THE NORTHERN REGION

The native peoples, the Komi and Nentsi, are of Finnish origin, the remains of a people which long ago came across the Altai and the Urals into Northern Russia. The Nentsi inhabit a national district which embraces most of the Tundra zone. The Komi inhabit the Pechora basin. In the fourteenth century both these nations were subjugated by traders from

Novgorod, who came from the south-west in search of furs, fish, and salt. In the fifteenth century traders from the Moscow State blazed a trail from the south to the north, towards Archangel, later to become the trade route along which flax, timber, and furs were exported during the sixteenth century to England. Where the Moscow route crossed the west-east Novgorod route the town of Vologda sprang up. Still later Leningrad superseded Archangel as the chief port of the north; Archangel declined, and became a poor, remote town which has revived only recently.

The Komi to-day number only 8 per cent. and the Nentsi 1 per cent. of the population of the northern region. The remainder is Russian.

Natural Divisions

The North-eastern Tundra Zone. This area possesses the coldest and driest climate of the entire region. Agriculture in the normal sense is impossible. The native Nentsi are nomadic tent dwellers. They hunt wild deer on the western slopes of the Urals, but depend mainly upon their own semi-domesticated reindeer herds for transport, clothing, and food, and the skin for their tents. During the summer they migrate towards the coast in order to pasture their herds on the grass, small plants, bushes, and lichens of the Tundra, and to escape the mosquitoes, which are a menace to animals and man in the warmer south. During the winter they move into the borders of the coniferous forest zone, where they are sheltered from the winds, and where they supplement their income by hunting. The establishment of collective 'reindeer farms' and schools and medical stations has improved the life of these people enormously.

Fishing is an important occupation during the summer, and a considerable industry has developed with Naryan Mar, at the mouth of the Pechora, as its centre. This town is also a timber-exporting port, with saw-mills and an electric-power station. Coal as well as timber is shipped downstream to the town from the Pechora basin, and coal is sent to bases which supply the icebreakers on the northern sea-route.

The problem of supplying the people of the town with food has been overcome by the establishment of state farms, where potatoes, vegetables, and barley are grown (see p. 194).

The Eastern Zone. This area is the national territory of the Komi, who are not nomadic like the Nentsi, but together with the Russians engage in agriculture, lumbering, and fishing. Agriculture is confined mainly to the rearing of cattle and producing small crops of hay in the valley meadows.

In the south there is a new wood-working and wood-chemical industry at Siktivkar, situated at the junction of the Vichегда and North Dvina rivers. In the north, the people of the two small settlements of Schelyur and Krasny Bor are engaged in the treatment and tanning of hides and skins. These villages are situated near the junction of the Izhma and Pechora rivers.

The importance of this section of the northern region has increased with the discovery of coal on the flanks of the Urals, in the valley of one of the tributaries of the Pechora, and of oil in the Uktha valley, and iron to the south of Siktivkar.¹ The exploitation of coal in the Pechora basin has expanded considerably during the war with Germany, and has been assisted by the construction of the new North Pechora Railway.

Besides being sent north to Naryan Mar the coal is also sent south to the Urals industrial district. There is a small metal-working industry to the south of Siktivkar (see Fig. 30), and some years ago it was planned to link this small town by rail with the Kirov-Kotlas line. It is not known whether the construction has actually been carried out.

The North-west. The north-western part of the region is drained into the White Sea by the Onega, North Dvina, and Mezen. The badly drained marshy and forest areas between the valleys are largely uninhabited, and the population is concentrated in villages which are strung out along the river sides. Cattle, especially cows, are reared in the valley meadows

¹ "Now one no longer speaks simply of the coal and oil of the north. One must also speak of the iron ore, manganese, limestone, lead, zinc and bauxite, tin, molybdenum, tungsten and rare metals."—N. ANDRONOV, "Northern Land of Promise," in *Soviet War News*, No. 673, September 27, 1943.

and some rye, oats, and barley are grown. But the severe climate and poor soils make agriculture difficult, so that lumbering is the chief occupation. There are a number of saw-mills on the rivers, and the extraction of resin from wood is carried on throughout large areas. There are saw-mills and wood-working plants at Onega and Mezen. At the latter town there is an important new paper-manufacturing industry.

Not far from Archangel the river Pinega joins the North Dvina, and the basin of this tributary is typical of the north-western forest lands. The fir and pine forests extend right down to the banks of the river, the thick dark green mass of trees being broken only occasionally by steep cliffs of yellow and red sandstones or greyish-white clays.

Agricultural settlements are confined to the lower reaches of the river and its tributaries. Between the streams stretch large unpopulated areas of lonely marsh and forest, visited occasionally by hunters. The marshes are especially common in the flat land which forms the watersheds between the streams, and contain numerous lakes, often surrounded by low morainic hills. Further evidence of the effects of the Ice Age is offered by the river net. The Pinega flows northward until, close to the source of the Kuloi, it turns sharply to the west, and joins the North Dvina. Towards the end of the Ice Age the Pinega continued northward down the Kuloi valley, following the edge of the retreating ice. Later, when the ice had retreated farther, it flowed westward into the North Dvina.

The river is the only highway in this remote forest land, and it also provides, during the short summer season, the means of floating timber down to the saw-mills at Archangel. Archangel is as well the most important industrial centre. It is connected with the interior of European Russia both by the North Dvina and the canals which link it to the Volga Basin, and by rail, while its importance as a timber-exporting port is demonstrated by the huge stacks of timber which line the banks of the river for miles above the city. There are several wood-working plants engaged in such processes as the manufacture of plywood; there are saw-mills, and a

growing wood-chemical, pulp, and paper industry. Wheat and flax are shipped from the south to supply the flour-mills and linen factories of Archangel. The tanning and dressing of hides and skins is carried on, while there is a small metallurgical and ship-building industry. Electricity is supplied by the city power station. Coal is brought by sea from Spitzbergen and the Pechora basin, and by rail and barge from European Russia.

Onega and Mezen are also engaged in the export of timber. But Archangel is the most important centre for this trade, being second only to Leningrad among the northern ports which send timber abroad. The northern region as a whole produces about 15 per cent. of the sawn timber of the entire Soviet Union, and a third of the export timber.

Vegetable production and the rearing of cattle for milk are carried on in the Archangel district to a considerable extent, in order to supply the urban market.

Finally, mention must be made of the fisheries and the associated industries. Fish-salting and canning are important occupations at Archangel. Salt is obtained from salt works situated on the southern shores of the Gulf of the North Dvina.

The South-west. The south-western corner of the northern region experiences warmer summers, milder winters, and a heavier annual precipitation than the rest of the region. Thus, although settlements are still confined to the valleys, a greater amount of flax, rye, oats, and hay is produced, and more cattle are reared.¹ The western part of the area is served by the Vologda-Archangel Railway, which has now a branch line extending at least as far east as Velsk, with connexions at Vologda for Leningrad, Moscow, and the Urals industrial district. The eastern portion is served by the railway which has its terminus at Kotlass, and the construction of new lines connecting the town with Soroka, on the Leningrad-Murmansk line, with Siktivkar to the east, and another line running to the south-west, has been planned and may have been

¹ In the Vologda region extensive meadows support large dairy herds—the basis for the production of the well-known Vologda butter. There is a smaller but similar region around Kholmogory, south of Archangel.

completed. In addition to the railways there are several roads and a good system of navigable rivers and canals—in striking contrast to the roadless nature of the greater part of the rest of the northern region. This corner of the region is thus in fairly close contact with the more populated areas of European Russia, and is in effect a transitional zone between the remote north, looking to the Arctic sea-route for its future development, and the south, connected economically with the big urban foci.

The areas with the greatest population lie near to the railways or on navigable waterways which have connexion with them. The most important urban centres are shown in Fig. 30. Near Velsk, Totma, Kotlass, and Vologda there are electric-power stations. There is a wood-working and a linen industry at Shenkursk, and matches are manufactured to the south of Velsk. In the Vologda and the Kotlass-Veliki Ustyug district there are butter, paper, and linen manufactures, flour-milling, tanning, and timber industries—all obviously dependent upon local raw materials. In the two latter districts there is a large paper and wood-chemical industry.

Solvichegodsk, situated on the river Vichегда, provides an interesting example of the economic development of one of the smaller towns in this part of the northern region. The town dates from the fourteenth century, when the evaporation of salt from a near-by salt lake was commenced. From the sixteenth century onward, local salt and iron deposits (see p. 110), together with furs, provided the basis for trade with Novgorod, Moscow, and Astrakhan.

The famous Russian family of Stroganov came to Solvichegodsk at the end of the fifteenth century, and founded a whole 'dynasty' of fur-traders and salt-manufacturers. The wealth and commercial prosperity of the little town attracted famous craftsmen from all parts of Russia—coppersmiths, blacksmiths, silversmiths, tanners, sailmakers, and boat-builders. Solvichegodsk soon became the most important commercial centre in North European Russia.

To-day, with a population of 4000, it possesses a number of small iron-foundries, a small electric-power station, a

machine-tractor station, serving seventy collective farms, a flour-mill, and a butter factory. It is the administrative centre for a district in which agriculture is expanding rapidly as a result of the successes achieved in the cultivation of northern wheat and high-yielding varieties of flax. Timber, however, still provides the chief basis for industry. The logs are floated down the Vichегда river and North Dvina to saw-mills at Kotlass and Archangel.

About eight miles south of Solvichegodsk construction is in progress on a large paper-cellulose works at what is now the village of Koryazhma. Important deposits of bog-iron and salt beds of great thickness have been discovered, and may provide the basis for considerable industrial expansion in the future.

Population

As we have mentioned above, the greater part of the population of the northern region is situated in the Archangel district and in the south-west. Everywhere there is a concentration in the valleys, with large uninhabited spaces between them. The western portion of the region contains 95 per cent. of the total population.

Nentsi . . .	17,000 (estimated).
Komi A.S.S.R. .	318,969 (urban, 29,163; rural, 289,806).
Archangel District .	1,199,178 (urban, 435,290; rural, 763,888) (Archangel, 281,091).
Vologda District .	1,662,258 (urban, 284,981; rural, 1,377,277).

The population of the remainder of the northern region is probably not more than one and a half million. Of the total population of the region 90 per cent. is Russian and 8 per cent. Komi.

NORTHERN SIBERIA

East of the Urals the climate rapidly becomes more severe and continental. Rivers remain frozen for as long as seven months of the year, and large areas of the subsoil remain permanently frozen. The navigation of the Arctic becomes

more difficult. There is a complete absence of roads and railways, and the country is very remote and separated from the more populated centres of the U.S.S.R. by immense stretches of lonely, almost uninhabited country. Before the establishment of the Soviet Union these far northern lands supported only a few deer-breeders and hunters. It is only recently that the great north-flowing rivers have been utilized to some extent to solve the transport problem and make possible the utilization of the great natural resources of Siberia.

THE BASIN OF THE LOWER OB

Physical Characteristics

To the north of Tobolsk the low, level plain of Western Siberia, sloping only very slightly towards the Arctic, remains to-day a badly drained wilderness of forest and marsh. The lower course of the Ob branches out into numerous inter-connecting channels which are constantly shifting. The spring floods inundate immense tracts of the country on either side of the banks, and consequently there are extensive areas of thickets and swamps, while the actual banks of the river are strewn with heaps of rotting wood, gravel, and stone. The flood zone has a width of about twenty-five miles.

Sandbanks which form in the channels in the lower course of the Ob during the summer hinder navigation. Owing to the flat nature of the land the current is slow, and consequently in the autumn the water freezes quickly. Small river vessels may travel upstream almost to the foothills of the Altai. But larger ships can proceed no farther than Nakhodka, at the mouth of the river. The estuary is deep, and widens out into a gulf about thirty miles in width.

In summer the Tundra on either side of the mouth of the Ob presents a varied landscape, with a colourful mixture of flowers, moss, and turf. Huge clouds of mosquitoes, however, make life difficult for man and animals alike.

In the west are the rocky slopes of the Northern Urals, with high granitic and quartzite peaks. Towards the northern end the mountains become lower, and form a plateau from which

rivers flow out in all directions. In the extreme north the Urals split into a number of high massifs.

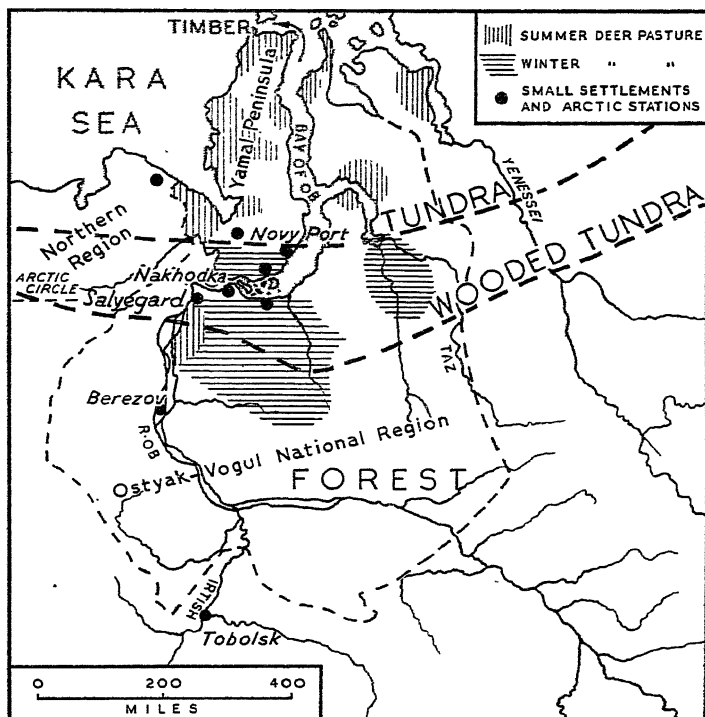


FIG. 31. THE LOWER OB

Human Activity

Apart from the severity of the climate, human activity is restricted by the absence of minerals and the difficulty of obtaining timber from the swampy lowlands. The small native population consists mainly of Ostyaks, Voguls, and Nentsi, who live in tents and huts and engage in hunting,

fishing, and reindeer-breeding. Ostyak Vogulsk is the centre of the Ostyak Vogul national region. It is a fur-trading centre. Around the gulf of the Ob there are a few small settlements with not more than a few hundred inhabitants in each. Salyegard is the centre of the Yamal-Nentsi national region.

From this settlement geographical and botanical expeditions have set out during the last few years to map the land and the Tundra vegetation in order to discover where the best pasture is situated, and divide it out among the Nentsi reindeer 'collectives' in such a way as to avoid long journeys between summer and winter feeding-grounds. There are a number of Nentsi reindeer-breeders around the Ob estuary. Previously it was not unusual for them to come to the Tundra in June, and return to the Taiga in August, making a journey of 500 to 1000 miles!

Some of these peoples travel to the coast, where there is an abundance of fresh pasture; the weather is not so warm as farther inland (where the summer heat is often most uncomfortable), and the mosquitoes are not so numerous.

The old men engage in fishing, selling their catch at one of the Government trading-posts.

During the winter the Nentsi spend three or four months in one place, and at their settlements it has been possible to introduce education, medical assistance, the radio, and the cinema. Even in the summer, however, 'culture bases' move about with the tribes, each base being equipped with a chemist, radio, gramophone, and library.

At Salyegard the chimneys of a large fish combine rise above the Tundra, an outpost of industry in the lonely country around the mouth of the Ob.

Nakhodka and Novy Port are small ports. Like Salyegard, they are engaged in the fur trade, and export a certain amount of timber by way of the northern sea route. State vegetable and cattle farms supply the 'town' dwellers with food.

Even the remote trading-posts which are situated along the coast of the Kara Sea are now all supplied with bread, potatoes, and vegetables.

Although in assessing the economic development of the

lower Ob it must be noted that there has been some considerable increase in the fur trade, the fisheries have become a definite industry, and the life of the Nentsi and the inhabitants of the various settlements has been improved, it seems that the difficulties of navigation on the river, the marshy nature of the land on either side of it, and the absence of useful minerals, preclude any substantial economic expansion in this region. It is the Yenesei rather than the Ob which is being developed as the most useful highway into the centre of the vast virgin country of Siberia.

BIBLIOGRAPHY

Russian

Articles published in "Nasha Strana" (Moscow)

- E. DOYRENKO: "In the Kara Tundra," in No. 3, 1940.
E. GAVRILOV: "The Twelfth Union Republic" (Finno-Karelia), in Nos. 4, 5, 1939. "New Districts of the U.S.S.R." (Finno-Karelia), in No. 3, 1940.
I. KAMENETSKI: "Niva-Z" (an account of hydro-electric development on the river Niva), in No. 8, 1939.
V. KHOLODOVSKI: "Sol-Vichegodskaya" (Kotlass region), in No. 12, 1939.
N. LEONTYEV: "Pechoria" (Pechora Basin and Komi Republic), in Nos. 4, 5, 1941. "Naryan Mar," in No. 8, 1939. "The Land of Blue Foxes" (Nentsi national region), in No. 9, 1939.
M. PERUVKHIN: "In the Pinega Forests," in No. 2, 1939.
I. SERGEYEV: "Karelia," in No. 8, 1939. "The Medvezhya Mountains" (Kola Peninsula), in Nos. 10, 11, 1939.
V. ZENKOVITCH: "The Mezen Seaboard," in No. 4, 1939.

English

- E. STEBBING: "The Forest Resources of North-east Russia," in *Geographical Journal*, vol. li (1918), pp. 359-371.

CHAPTER IX

The Lands of the North: Central and Eastern Siberia

The Basin of the Lower and Middle Yenesei

PHYSICAL CHARACTERISTICS

THE river Yenesei marks the boundary between two very different parts of Siberia. To the west lies the West Siberian Lowland, to the east the ancient Central Siberian Plateau, around the southern end of which Hercynian dislocation produced a series of mountain blocks and faulted basins. Throughout the remainder of the plateau there are only a few mountain ranges of any significance. The river valleys are mature, and the elevations between them smooth and rounded, with an elevation of 650 to 3250 feet.

Although, in common with the whole of Siberia, there are neither paved roads nor railways, there are no great obstacles to communications, and sledge tracks run from one valley to another, while the whole of the western portion of the plateau is connected to the Yenesei valley by a number of east-west valleys. The Yenesei itself flows along the eastern edge of the lowland of Western Siberia, so that its valley is broad and the river is wide, with a current which is not exceptionally fast. Above Yeneseisk the width of the river varies from one to four miles, according to the season, and river steamers ply upstream as far as Krasnoyarsk.

Altogether, the Yenesei possesses some 2000 miles of good navigation and another 3000 miles of navigable tributaries. Ocean-going vessels can enter its mouth with ease. The channel at Igarka is four miles wide, while at the mouth the river broadens out to a width of from 20 to 40 miles.

Along the eastern edge of the valley the land rises to the plateau escarpment, which has a general height of about 600 feet. The old rocks of the plateau contain valuable

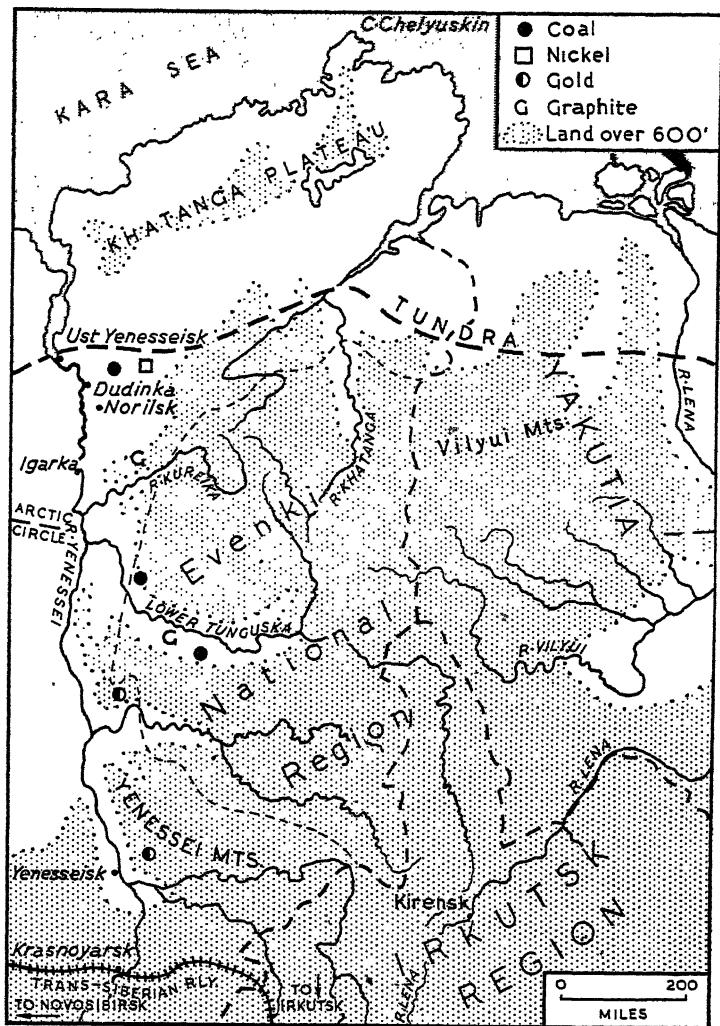


FIG. 32. THE LOWER AND MIDDLE YENESSEI

mineral deposits, including gold, while the Tungus carboniferous basin possesses immense reserves of coal. The large areas of swamp so common in Western Siberia are absent, owing to the elevation of the surface of the land, which is consequently well drained, and the dry nature of the climate. The northern edge of the plateau is separated from the Arctic Ocean by a lowland, from which rises the remains of an ancient highland mass, the Khatanga Plateau.

CLIMATE AND VEGETATION

Central Siberia stands in contrast to Western Siberia not only on account of the differences in relief. The climate, too, is sharply differentiated. The precipitation is very low, the winters are exceptionally severe, and the permanently frozen subsoil is more widespread and extends farther south.

The summers, however, are warm and dry. The July average temperature increases from 41° F. in the Taimyr Peninsula to 59° F. at Igarka and 68° F. at Krasnoyarsk.

Along the northern edge of the coniferous forest zone, July temperatures of 80° F. have been recorded.

The Yenesei is generally free from ice from the end of May until the middle of October.

The greater part of the plateau is forested, and the larch, an especially valuable timber, is common. North of the Kureika river the forests gradually degenerate into the Tundra zone.

HUMAN ACTIVITY

The basin of the middle and lower Yenesei is divided from the southern part of the basin by conditions of relief and climate. The southern portion is divided into mountain ridges and basins, the latter containing fertile black soils, while the longer and warmer summers and the heavier snowfall in winter create greater possibilities for agricultural development. Furthermore, proximity to the Trans-Siberian Railway unites this section of the Central Siberian Plateau with the industrial and more densely populated regions of Western Siberia and the Far East.

The northern portion of the Yenessei basin looks towards the Arctic and the northern sea-route, along which the resources of the land are exported. It should be noticed, however, that Krasnoyarsk is the administrative centre for the whole of the Yenessei basin, and that coal from the Tungus basin and nickel from Norilsk is sent south to the Trans-Siberian Railway, as well as north, to the Arctic.

The native Evenki who inhabit the northern forests live mainly by deer-breeding, fishing, and hunting.

Groups of reindeer-breeders or hunters now work together in 'collectives,' or artels. A great deal has been done to survey the grazing-grounds of the deer, and to allocate pasturage to the various collectives in such a way as to provide the greatest amount of fodder with the minimum travel. The storing of winter fodder is also practised (see p. 194). The advantages of working in such artels and adopting a more settled way of life are becoming increasingly obvious, and the wooden house is beginning to replace the tent and primitive hut.

There are still numbers of native people, however, who live in tents during the summer and in huts, constructed half below the ground level, in winter. The tents are made by stretching reindeer-skins over a framework of poles, and each tent holds a family of about seven people. During the winter fur blankets are used, and caps and boots are also made from fur. Reindeer-skin blouses are worn, together with trousers of the same material, tied above the ankles and below the knees. Sledges are made entirely from wood, without the use of a single nail.

Two of the most valuable animals which are hunted are the marten and the sable, and the importance of the fur trade is clearly shown by the annual output of 25,000 pelts and skins from the Taimyr Peninsula alone. The hunters take the skins to the fur-trading stations which have been established along most of the valleys. At the larger stations there are co-operative stores, and medical points. The breeding of reindeer is now being carried on in a more organized and scientific manner by the introduction of state reindeer farms

At Potapo, near Dudinka, for example, there is a 'farm' with a herd of 2000 deer. Other herds vary from 25 to 3000 head. Experiments have been made with the cross-breeding of the strong, plump elk of the Urals with the strong but more muscular animal of Central Siberia, in order to produce a good draught animal which will also give good meat.

In the Taimyr region, and other parts of Yakutia, the northern wild deer is hunted, and plays an important part in the economy of the native peoples. There are three types of wild deer. The Tundra deer lives almost entirely in the Tundra, in winter travelling south only as far as the borders of the forests—i.e., to the forest-tundra zone. The Siberian deer spends the greater part of its life in the forests, while the Marine deer lives on the islands off the Arctic shores during summer, crossing the frozen sea in late autumn, and wintering in the Tundra.

These wild deer are exceptionally hardy. The newly born animals are able to stand on their legs two or three hours after birth, while in two or three days they can run about quite freely. They grow and mature very quickly during the short northern summer. The flesh is particularly sweet and nourishing, while the skins provide material for clothes, bedding, and shoes.

The rivers provide the highways for summer transport, while in winter the deer sledge is used, except in the Far North, where the dog is supreme, since it can be fed with fish in areas where there is a scarcity of reindeer fodder.

The long sledge and boat journeys which formerly had to be made in order to carry valuable furs to the Trans-Siberian Railway have now been reduced by the new flying-boat service between Krasnoyarsk and Dudinka. The flying-boats land at stations along the Yenesei.

Along the coast and near the rivers fishing collectives have been organized. Seal-hunting is carried on with motor-boats and modern equipment, aeroplanes being used to assist in the location of the seals. Both fishing and hunting collectives are supplied with boats, nets, and traps by the co-operatives at the trading-posts. Near the mouth of the Yenesei fish-

curing and salting is done both at Russian and native settlements. At Kasanskoye barrels of fish are loaded on to ships for export, and there is a refrigerating and canning station at Ust Yenesseisk. Salt for the fisheries is obtained from Nordvik.¹

There are also several small Russian and native settlements along the banks of the lower Yenessei, where the people are engaged in fish-curing. Near Igarka, for example, there is a small village of about one hundred Evenki, who engage in fishing during the summer, and also possess reindeer herds. Reindeer-skins hang from the roofs of their huts, and barrels of herring, sturgeon, and perch are stacked ready for transport down the river. Such elements of civilization as sewing-machines and clocks, Russian quilted blouses, and skirts of cloth for the women are not uncommon now.

Cattle and horses are reared in forest clearings, and still farther south, in the neighbourhood of Turukhansk, some of the Evenki are following the example of the Russian settlers, and grow rye and barley. Near the Stony Tunguska there are even fields of flax and vegetables.

The Soviet Government is encouraging the people to adopt a more settled mode of existence and so raise their standard of life. The private trading of fish and furs for liquor—once the scourge of the north—is now forbidden and has ceased to exist. All trading is done through the co-operatives, and everywhere the native people are coming to appreciate the advantages of working in 'collectives.' A collective may consist of ten families, pitching their tents and working together. In the north they winter in the forest, but when spring comes they move towards the Tundra. Old men, women, and children stop at a large river and spend the summer fishing, using large nets in common. The younger men take the reindeer into the Tundra in search of good pasture. The fact that luxuries, unheard of before, such as motor-boats, can be obtained by the members of a collective, is something which proves very attractive to the younger men.

The Evenki National Area to-day possesses more than

¹ On the estuary of the Khatanga river, on the eastern side of the Taimyr Peninsula.

thirty schools and a good hospital, with an air ambulance service for urgent cases. Turukhansk is the national centre.

One factor which is encouraging a settled life, at least near the Yenesei, is the growth of the lumber industry. The excellent types of timber found near the river make it economical to float it down to the port of Igarka, for distances as great as 1000 miles. As far south as Yeneseisk there are lumber camps in the forests, within a mile or two of the river, employing about 200 men in each. The logs are formed into rafts, which may be a quarter of a mile in length, and their journey down to Igarka may occupy up to two and a half months. Igarka was chosen as the port for the entire region because it has the advantage of possessing an excellent deep harbour, while the current of the river is not too fast for the control of the logs. At Ust Yeneseisk, a port nearer the mouth, the river is too broad and too fast.

Igarka was established as the chief port on the northern sea-route in 1927. By 1939 the population had risen to 20,000—a remarkable achievement for a town situated within the Arctic Circle. During the summer the population is increased by the addition of some three thousand seasonal workers. Although on a small-scale map it appears that the port is close to the Arctic Ocean, the actual journey from Igarka to the open sea is equal to that from London to Glasgow, and occupies from two to four days. The voyage to England takes more than three weeks.

As the river and the Arctic Ocean are closed by ice for the greater part of the year the first ships do not enter the harbour until July, and all freighters must be clear of the Arctic by October. The loading season usually lasts only from the beginning of August to the end of September. The saw-mills, however, work throughout the winter, and the timber is stacked ready for shipment in the summer. The wharves and landing-stages have to be partly rebuilt each year, so great is the damage done by the blocks of ice which are sent crashing downstream when the thaw occurs in spring.¹ There are many

¹ After two years of work a permanent quay, half a mile long, was completed in 1936.

problems of water-supply, drainage; and plumbing to occupy the attention of civic engineers in a town where the subsoil is permanently frozen. The whole town is constructed of wood—mainly single-storey buildings. Even the streets and 'sidewalks' are 'paved' with wood. As one traveller remarked, the town smells of wood.

Electricity is obtained from a local power station, supplied with coal from the Tungus basin, and Igarka has considerable civic amenities to compensate for its general 'pioneer' character. The schools are attended by 2300 pupils, belonging to fourteen different national groups. The people are supplied with food from a state farm just outside the town. This farm occupies a few hundred acres of land in the wooded Tundra zone. Oats, vegetables, and hot-house tomatoes are grown. There are 350 cattle, 200 pigs, 250 rabbits, and a large number of hens. The animals are fed partly upon seaweed and fish. The poor soils have to be treated with chemical fertilizers and animal manure. During the long, dark winters the animals occupy heated sheds, and the hot-houses, constructed half under the ground, are insulated from the cold earth by a layer of sawdust and seaweed. The hens are encouraged to lay by electric light.

In spite of the short growing season—there are less than ninety frost-free days in the year, and there is but little snow cover to protect the ground in winter—surprising results have been obtained by the use of special seed, which is vernalized before being sown, and by taking advantage of the long hours of daylight during the summer.

Wheat, barley, and oats are cultivated in the open, although the subsoil is frozen a short distance below the surface.

Flour must be imported, together with most civilian supplies, by sea during the summer. But without the local supplies of milk, meat, and fresh vegetables Igarka could not exist.

Coal for the ships which visit the port is brought downstream from the Tunguska mines. Along the coast of the Taimyr Peninsula there are several meteorological and radio stations which serve the northern sea route. Nordvik is both a coal

base and radio station. Its staff of workers numbers 700. Dickson Island, another 'weather exchange,' situated on the Yenesei Gulf, has an area of only 30 square miles and a population of 200. Sheep, cows, pigs, and 'home-grown' vegetables keep the inhabitants supplied with fresh food. Oil has been discovered at Khatanga, south-west of Nordvik, and this may prove to be of great value in the future as a source of fuel for the vessels of the fisheries and the northern sea-route.

The value of the port of Igarka as the centre for the export of the wealth of Central Siberia is demonstrated by the fact that a journey by river and rail to European Russia is twice as expensive as the journey via the northern sea-route. The reliability of the route is now recognized to such an extent that insurance rates have been considerably reduced within the last few years.

Mining is the second occupation of importance in the Central Siberian Plateau. Coal and graphite are mined in the Lower Tunguska and Koreika valleys, and exported both by way of Igarka and southward to Krasnoyarsk. Some iron is also mined, and there are nickel mines at Norilsk,¹ a settlement situated to the east of Dudinka. Between the Upper and Stony Tunguska rivers, gold is obtained from the Yenesei Mountains. In 1936 the first derricks were erected at the newly discovered oil deposits of the valley of the Malaya Kheta (a tributary of the Yenesei).

The settlements of the middle and lower Yenesei basin were formerly remote places, entirely cut off from the outside world. River steamers and aeroplanes² have now broken their solitude, and the new life which has come to the Siberian forests is attracting a growing number of pioneers. Small

¹ There are also important deposits of gold, platinum, and copper close to Norilsk, and these, together with nickel, are refined at the Polymetallic Combine in the town. Norilsk has a population of 30,000, and is linked by road with the port of Dudinka, from which metal is shipped via the Arctic, or via the Yenesei to Krasnoyarsk and the Trans-Siberian Railway.

² The journey from Krasnoyarsk down the Yenesei valley to Dudinka formerly occupied forty days by horse or nine days by river steamboat. To-day aeroplanes complete the journey in ten hours.

villages have rapidly increased in size. The small port of Ust Yenesseisk, for example, has now a population of 2000, engaged mainly in work at the new fish-cannery. But it must be emphasized once again that without the development of 'Arctic agriculture' to supply the people with fresh milk and vegetables, and the opening of the Arctic Sea route as the link between these remote areas and the outside world, this great expansion could not have occurred.

The Yakut A.S.S.R. and the Basin of the Lena

This region embraces the Lena basin and the basins of the Yana, Indigirka, and Kolyma rivers. It is divided into the following natural regions: (1) the basin of the middle and upper Lena; (2) the mountains, plateaux, and valleys of the south; (3) the Yana, Indigirka, and Kolyma valleys; (4) the valley of the lower Lena.

The region as a whole consists of the eastern portion of the Central Siberian Plateau, bounded by a lowland along the Arctic coast, mountains, plateaux, and valleys in the south, and a series of mountain chains along the eastern border stretching from north to south, over a distance of more than 2000 miles. The distance across the region from east to west is almost 1500 miles.

The plateau is drained by the Lena, which descends from the mountain ranges near the western shore of Lake Baikal into a broad, open valley. The total length of the Lena navigation is about 2500 miles, while the tributaries possess about 600 miles of navigable waterways.

PHYSICAL CHARACTERISTICS

The Basin of the Upper and Middle Lena

Rising in the mountains close to the western shore of Lake Baikal the Lena flows across the plateau in a narrow valley cut deeply into the Cambrian and Silurian rocks. Small boats of shallow draught can proceed upstream as far as Verkholsensk, but Kachug is generally regarded as the limit

of navigation for river steamers, and here the Lena is of about the same width as the Thames at Oxford.¹ The fact that the Lena is navigable to a point so near to its source is of the greatest importance to this vast region, which possesses no railways and only a few poor roads. Navigation is, however, limited in the upper part of the river by the shallow condition of the water at the end of the dry summer.

Between Kachug and Kirensk the valley is bounded by high cliffs and steep forested slopes, rising in places to a height of 1000 feet. At the junction with the Vitim river the width of the Lena has increased to about a quarter of a mile. Below this point the valley broadens out into an open plain, and the banks are low and flat. The width increases to four or five miles, and the channel is studded with a number of large forested islands. At Yakutsk the distance from shore to shore is more than seven miles.

The difference between the character of the upper and middle portions of the Lena valley is caused by a change in the geology. The old, hard rocks of the upper basin have restricted the development of a broad valley in the main stream and the tributaries, and produce a poor thin soil cover. Below the junction with the Vilui, however, the valley has been worn out from a covering of softer Cretaceous and post-Tertiary deposits.

This is reflected also in the human geography, for while settlement is restricted to a few points in the upper valley, the native Yakuts and Russian settlers have developed agriculture and stock breeding to a considerable extent in the lowlands of the middle Lena, and its tributaries.

These factors have an important bearing upon the position of Yakutsk, the largest settlement and the centre for the entire region. Since transport and communications are limited to the navigable rivers, and tracks or roads along their valleys, it is obvious that Yakutsk lies near the junction of

¹ Kirensk, 1110 miles up-river from Yakutsk, is the point of transfer for freight from the road which connects the town with Irkutsk on the Trans-Siberian Railway. Ust-Kut is the transfer port for the new branch railway from Taishet, 270 miles east of Krasnoyarsk. See *Soviet Asia*, by R. A. Davies and A. J. Steiger (Gollancz, 1943).

all the main thoroughfares of this part of Siberia. Furthermore, it is situated at a point where the Lena valley is crossed by a transverse depression, the western section of which is formed by the Vilui valley. The upper Vilui valley is followed by a sledge route to the valley of the lower Tungus and thence to the Yenesei. Towards the north-east the depression forms the local highway and 'mail-route' to the isolated settlements of the Kolyma valley, crossing the mountains by a pass at an elevation of about 2000 feet, and to Verkhoyansk, by means of a pass which is 4000 feet above sea-level. Although of no importance at present, the shortest route from the Pacific also reaches the Lena at Yakutsk.

The Mountains and Plateaux of the South

To the east of Lake Baikal the southern edge of the plateau consists of hard pre-Cambrian, metamorphic, and igneous rocks, divided into mountains, plateaux, and deep valleys, running in a direction from south-west to north-east. The Yablonoi Mountains, continued to the south-west as the Malkhansk Range, constitute the watershed between the Arctic and Pacific drainage basins. This watershed is continued towards the north-east as a great arc of mountains—the Stanovoi and Dzhug-Dzhur Ranges. The slopes of these ranges are relatively gentle on the western side. They rise to a height of 9300 feet and are cut by deep valleys, above which tower sharp, high crests. Thus there is a very definite physical barrier between the plateau of Yakutia and the Pacific coast to the east and the Amur basin to the south.

From this mountain barrier three rivers—the Vitim, Olekhma, and Aldan—flow to the Lena, and between them lie the Vitim-Olekhma and Aldan Plateaux, two of the most important gold-bearing regions of the Soviet Union.

Although a large part of these plateaux is forested, there are considerable areas of barren rock, low, rounded hills, and great slabs of crystalline rock, sometimes lying in a horizontal position, sometimes forming immense tilted blocks. The steep, rocky sides of the valleys are often seared by

volcanic dykes, and towers of diabase rear their broken, ragged outlines against the sky in fantastic shapes, like the ruins of ancient castles. Only the lower parts of the rivers are navigable. The Vitim, for example, is obstructed by falls about 340 miles above its junction with the Lena. Below this point it enters a wide valley consisting of alluvial plains which occupy the sites of the beds of old lakes. Along the western edge of the valley there are extensive exposures of lava beds for a distance of about 70 miles.

The Valley of the Lower Lena

In its lower course the Lena receives practically no tributaries. The valley is broad and of low elevation. Near the mouth the river flows through a countryside which consists of an immense frozen waste in winter, and a maze of bare rock and flood-lakes in summer. There is an immense delta, in which the river divides into numerous streams, which are often obstructed by countless shoals and mudbanks. Although the Lena is generally free from ice for 120 days at the mouth and 160 days in the south navigation is often impeded or completely stopped by ice-floes which may block the mouth throughout the summer.

The Valleys of the Yana, Indigirka, and Kolyma

The Yana, Indigirka, and Kolyma are large, navigable rivers, separated from each other by high mountains and plateaux. The Verkhoyansk and Cherski Ranges exhibit strongly marked Alpine features—steep sides, and high, sharp crests. The mountain streams which rise in these ranges flow into wide valleys when they enter the plateaux, and finally enter the Arctic after passing over a coastal lowland. Thus the three main rivers all have rapids which obstruct their upper courses, features which are typical of immature river systems, while the wide, slow-flowing lower reaches, with numerous small islands in the deltas, are mature.

In the lower Kolyma and in the lowland which borders

the Arctic Ocean remnants of ice from the Quaternary glaciation may still be seen. In some cases the depth of this ice is as much as 50 feet, and often conceals the frozen remains of mammoths in a remarkably fine state of preservation. Trade in mammoth ivory from Northern Siberia is still considerable.

An interesting phenomenon, described more than seventy years ago by Baron Mäidal in the account of his travels from Irkutsk to Anadyr, is to be seen in the valley of the Kira river, at the foot of the eastern slopes of the Tass-Khayakhtakh Range, about 300 miles east of Verkhoyansk. Here there are vast fields of ice covered by a mixture of water, slush, and soft ice, which makes it impossible to cross them. They are known as 'naledye.' They occur on or near a watershed, in a region of light precipitation, where the subsoil is perpetually frozen, so that the origin of the ice is not to be found in the ground water, which could not possibly create vast ice-formations, 60 miles in length in places, and occupying an area of 20 square kilometres. Recent exploration has discovered that they are caused by springs, which originate deep in the earth. The temperature of the water issuing from these springs was found to be 0.6°C .—remarkably high when one considers that the subsoil is always frozen to a considerable depth.¹

The whole of this region is separated from the Lena basin to the south and west, and from the north-eastern extremity of Siberia, by the great arc of mountains formed by the Verkhoyansk, Kolyma, and Anadir Ranges. It is, therefore, an extremely remote part of Siberia, maintaining contact with the rest of the U.S.S.R. by a track to Yakutsk, a single road which connects the gold mines of the upper Kolyma with the coast of the Sea of Okhotsk, and the summer steamship service between the mouth of the Kolyma and Vladivostock.

¹ The Yakut name for this phenomenon is 'taryn.' Similar occurrences are common on the surface of rivers which have become frozen almost to the bottom. In this case, water below the ice is forced through the ground at the river-banks, and spreads to the surface of the river and over adjoining land, forming a vast, partially frozen mass.

CLIMATE AND VEGETATION

The winters are extremely cold. But the clear, dry, calm nature of the climate makes it possible for man to endure even the lowest temperatures. Another effect of the calm anti-cyclonic weather of the winter season is the penetration of trees to a more northerly latitude than is possible elsewhere in Siberia.

Even in the south November temperatures of -37°F . are common. The sky is clear and the sun shines brightly. When the thermometer registers sixty or more degrees of frost, however, the atmosphere grows misty and the colour of the sun becomes a dull red. During extremely cold spells a yellow fog develops. Very often during the winter the dead white landscape is hardly distinguishable from the sky. In the autumn all the windows of houses are sealed up with putty, and double windows are universal. Between the two panes of glass dry moss is placed in order to absorb moisture and prevent condensation.

The most severe weather, and the most difficult to endure, is experienced when the dreaded *purga* or snowstorm occurs. The sun disappears altogether, and the country is enveloped in a dismal twilight. The snow is lashed up from the ground by the wind, and fuses with the grey of the sky into a sort of grey-white fog of snow. Travel is practically impossible.

Spring comes suddenly, in the middle of May in the southern half of the plateau. By the end of May the snow has completely disappeared and remains only on the highest mountain-tops. In the Yana-Kolyma region, and generally throughout the Far North, spring is heralded by the arrival of the first geese. Then the last *purga* of the winter season takes place; large numbers of geese fly over the country on their way to the Arctic shores, and a warm wind begins to blow from the east. The shade temperature rises to 44°F . and in the sun it is very warm. Little rivulets begin to form upon the ice of the rivers. Ice and snow thaw, and the whole landscape becomes transformed into a vast expanse of water. Then the ice on the rivers breaks, and the land on either side

of the banks is flooded. The rivers are useless for navigation, since the current is torrential. Tree-trunks and brushwood are carried downstream and blocks of ice crash one against the other, and tear away huge portions of the river-banks. The roads are impassable swamps. This great struggle between the torrents of water and the melting ice is called the *rasputitsa*. Finally the summer season is established, and the white mantle of winter is exchanged for the green mantle of forest, grass, and flowers, and the steaming earth is baked by the warm sun. There is usually very little rainfall. There is always the possibility, however, that snow may fall, even in the middle of July.

By the end of the summer the ground is very dry, and there is very little water in the streams. As the subsoil is perpetually frozen, the ground cannot absorb and store up water during the spring. In warmer latitudes ground water provides a vast reservoir from which springs, streams, and rivers are supplied during the summer. Here, however, the water from the melting snow and ice flows off the surface quickly into the rivers, leaving the ground so dry in summer that in certain parts of Yakutia irrigation is practised!

Along the shores of the Arctic Ocean rain, fog, drizzle, and temperatures of 30° to 35° F. are common in the middle of summer. Elsewhere, however, the warm dry summers have made possible the extension of agriculture as far north as the middle-Lena valley in the neighbourhood of Yakutsk. Cattle may be reared and a certain amount of hay produced, even in the upper parts of the Yana, Indigirka, and Kolyma valleys.

Autumn, like spring, is a very short season, lasting for only one month—September. In the Tundra zone the first snow falls at the end of August, and in the southern part of the coniferous forest zone at the end of October.

Apart from the highest mountain-tops, and the Tundra zone of the Far North, the entire region is covered with forests, which contain valuable fur-bearing animals. There is very little variety of trees in the north. The dark and gloomy fir forest is typical. In the south, however, the forest is composed

of a mixture of different types of timber. The larch is found everywhere. In drier and lighter positions the larch is mixed with fir, birch, pine, aspen, and alder. The undergrowth, too, is varied, including numerous bushes such as the red-currant and whortleberry. Only in the lower and damper parts of the valleys does the 'Black Taiga' prevail—making a dense and shady cover of firs and cedars. The ground is carpeted with moss, and the trunks of the trees covered with lichens. Towards the north, near the Arctic Circle, the growth of trees becomes very scanty. They are thin, spindly, and poorly developed, giving little protection to man or beast against the winter snowstorms, and are mixed with Tundra and bog. The true forest, however, penetrates to 72° N. along the valleys.

The Tundra itself is a wilderness of marsh and water in summer, and a great frozen desert in winter.

Considering this part of Siberia as a whole, it may be described as a land of extreme cold in winter, with remarkably warm, dry summers. The land possesses colossal resources of timber and fur-bearing animals, and, to a greater extent than any other part of Northern Siberia, has considerable agricultural possibilities in the valley lowlands, where the farmer can take advantage of the long, warm, sunny days of the summer for rearing cattle and ripening crops.

Even in the valleys of the Yana, Indigirka, and Kolyma cattle are reared.

HUMAN ACTIVITIES

The Valley of the Lower Lena, and the Valleys of the Lower Yana, Indigirka, and Kolyma

From the point of view of human activity the whole of this area may be described as a reindeer-breeding, fishing, and hunting zone. It is the most remote and most thinly populated part of Yakutia, lying within the Arctic Circle and experiencing very severe climatic conditions.

The life of the Yukagir people is typical. This small group of people represents the remnants of a very early migration into the north. Hence they are regarded as belonging to the

Palæo-Asiatic ethnic group. They are nomadic deer-breeders who migrate into the Tundra with their herds during the summer, and fish both in the rivers and in the sea. Many of them seek out the mammoth-tusks which are found in the Tundra, and trade the ivory. The herds of reindeer often number many thousands of animals, some white, some dark, and others of a mixed breed. Usually only one or two hundred are domesticated. The Yukagirs ride on these animals and use them for drawing their sledges. The weaker, smaller, and fatter reindeer are generally kept for breeding and for slaughter. The young deer are born in May, and the period during which they are trained as draught animals varies from a year to eighteen months.

During the summer the native camps are to be seen among the trees in the wooded Tundra zone. The tents consist of the usual framework of poles with reindeer skins stretched over them, a hole being left in the top of the tent to serve as a chimney. Early in the morning the men round up the deer with the aid of lassoes. None of the animals strays very far from the camp, and the more adventurous among them are prevented from roaming too far by fastening a pole across the neck. This tends to catch in the branches of bushes and trees, and so retards movement. The teams are harnessed to the sledges, and the tribe sets out towards the Tundra for a day's hunting. Even where there is no snow the sledge is still used. The old men, women, and children who are left behind busy themselves with such tasks as collecting and chopping wood, scraping pelts, and sewing skins together. They are the tailors for the tribe. There are also many clever smiths who are skilled in the working of copper and iron. They fashion excellent knife blades, ornaments, cooking utensils, and so on.

In the evening the members of each family sit together around the fire in their tent, taking their meal and smoking pipes. There is usually a copper kettle on the fire, while around the tent are piles of skins, hay, quilts, clothing, etc.

Many of these tribes spend the winter in crude 'wigwams,' constructed in the same way as the tent, the only difference

being that in place of the skins brushwood and turf are placed over the framework. Others adopt a more settled mode of life, and during the winter return each year to a definite settlement, a small 'village' composed of huts built half below the ground.

In the extreme north there are such settlements in the true Tundra zone, where one may meet people who have never seen a living tree. For the construction of huts and sledges driftwood is collected from the rivers. There is not sufficient fodder for reindeer, so that only dogs are used, and without the aid of the dog human life would be impossible. Fish can be obtained almost everywhere, and provides food for both man and dog. The skin of the white fox provides the only source of income. Beef is unknown to these people, and bread is very rarely eaten. Reindeer meat is purchased from those tribes which possess reindeer, and a favourite dish is a sort of pudding made from congealed blood.

In the lower part of the Indigirka valley about four or five hundred people live in this manner. Trapping is carried on within a radius of a hundred miles of the settlement, the traps being set about half a mile apart. They are visited usually four times a year. Each visit entails a journey by dog-sledge of several weeks, in all kinds of weather.

The autumn is a most important season. The snow is thick, and has not had time to consolidate. Consequently the fox tends to sink into the snow when pursued and cannot make good progress when he attempts to elude his pursuers. It is for this reason that hunting rather than trapping is the autumn occupation. The fur of the fox is particularly white, light, and thick, at this time, and upon the success of the hunting depends the possibility of being able to purchase tobacco, tea, and even such luxuries as sugar, during the remainder of the year. The Yakuts usually come down from their homes in the upper reaches of the valleys during October, riding their reindeer in the hunt.

Chains of fur-trading co-operatives are established along the valleys, while along the tracks between one valley and another, or between one trading station and another (the

distance may be anything from 20 to 200 miles), there are rest houses, primitive huts where the traveller may spend the night or seek shelter from the terrible *purga*. The autumn and winter are both busy seasons, for it is only when the snow lies upon the ground that long journeys can be made. Eight to twelve dogs are harnessed to a sledge, and very long journeys can be made with their aid. It is not considered unusual to travel 400 miles in this manner at the rate of 20 miles a day. Although the small dray reindeer may draw a sledge from 20 to 30 miles in a day the dog is generally considered to have greater powers of endurance.

Hunting continues from the beginning of October until the middle of May. Then follows the *rasputitsa*, described above, when transport of any kind is impossible. During June the villages are deserted. The whole population turns out, travelling down the rivers on fishing or goose-hunting expeditions, or collecting logs and brushwood for the winter fuel supply. When a goose-hunt is organized the men travel some hundreds of miles down-stream in light wooden craft, which they often take thirty or forty miles across the open sea in the gulfs at the river mouth. The geese moult in thousands on the shores of the Arctic, and during the moulting season are quite helpless. With a great deal of shouting and noise they are surrounded and driven into huge nets. They are then killed. At the end of a week as many as four thousand birds may have been slaughtered; their bodies are piled up into a huge heap, smeared over with mud, and left to freeze. They cannot be transported during the summer, as the boats are too small. But during the winter these huge dumps of frozen flesh are visited and the meat taken away by sledge.

Sometimes a caribou is shot, and the carcass buried and left as food for the dogs during the winter trapping expeditions.

Should it ever be possible to develop fast air-transport for freight to and from the Arctic shores, an immense new source of food supply for the towns of the U.S.S.R. could be created.

There is no industrial activity in the lower parts of the north-flowing rivers of this region. It is known that there are deposits of silver, lead, and coal near the mouth of the river

Lena, and further exploration is bringing to light mineral deposits in the valleys of the other rivers and in the mountains between them. So far, however, the remoteness of the region and the lack of labour and transport have prevented their exploitation. Plans have been made to work the coal deposits at Bulun, near the mouth of the Lena, in order to provide a fuel base at the new lumber port of Tixie Bay, on the Lena delta. This is one of the ports of the northern sea route, and it is hoped eventually to develop it in relation to the Lena basin in the same way that Igarka has been developed as the port of the lower Yenesei. Since it is impossible for ocean steamers to proceed up the Lena, cargoes are transferred to river boats at this point.

The Kolyma river is also served by a small Arctic port—Nizhne Kolymsk. Boats from Vladivostock call here each summer, bringing supplies to the co-operatives at the trading stations and taking away cargoes of valuable furs.

Bulun is a straggling village of wooden houses situated on the high left bank of the Lena. It contains about two hundred and fifty inhabitants. Nizhne Kolymsk is important locally as the chief fur-collecting point for the Yana, Indigirka, and Kolyma valleys. It is visited regularly by the nomadic Chukchis who live mainly between the Kolyma river and the Behring Strait.

The Upper Valleys of the Yana, Indigirka, and Kolyma Rivers

The upper valleys of these rivers are distinguished from the lower valleys by the fact that the former are situated within the coniferous forest zone. Hence, in addition to the usual occupations of reindeer-breeding, hunting, and fishing, the meadows in the valleys of the rivers and their tributaries support small herds of cattle and horses. The inhabitants of this region are almost exclusively Yakuts, whom we have already described as being an enterprising and resourceful people, possessing great ingenuity. They introduced cattle-rearing from their original home in the steppe lands far away to the south.

One explanation of the possibility of stock-rearing in such high latitudes is the occurrence of 'islands' of steppe, the remnants of an earlier steppe vegetation, when the climate was warmer, and still preserved on south-facing slopes where the climate to-day is relatively mild and drier than elsewhere. In the Verkhoyansk-Oimekona district, for example, although the average January temperature is -58°F. , the average for July is 62°F. , and the precipitation is 5 inches. These are practically steppe conditions, and the surface soils in these steppe 'islands' are chestnut brown in colour, very similar to those of the Kazakhstan.

The animals which the Yakuts rear are the shaggy Mongolian yak, and a small, sturdy type of horse.

In the past large numbers of cattle had to be slaughtered in the autumn, since the poor summer pastures provided only scanty reserves of hay for winter fodder. The animals which remained shared the dwellings of the people during the winter. To-day, however, the organization of 'collectives' and the introduction of veterinary and agricultural specialists has enabled the Yakuts to make use of improved types of sown grasses, while heated sheds are now more often used as winter quarters for their stock. Small areas are being sown with barley, rye, and vegetables. Most of this agricultural development is being carried on by the Yakuts. The Evenki (Tungus) tribes still maintain their traditional occupations of hunting and trapping fur-bearing animals, and hunt the wild deer, elk, and mountain ram in some districts, for food. They engage in other pursuits only to a very slight extent.

The old native Yakut dwelling, or *yurta*, consists of a long frame, the sides of which are inclined towards the flat roof. The spaces between the logs are filled with brushwood, earth, and mud, and in the autumn water is poured over the outside so that the entire structure becomes a solid frozen mass. The small windows contain slabs of ice in place of glass. During the summer the Yakuts, like the Evenki, live in wigwams during their hunting and fishing expeditions.

Silver and lead are mined in the upper Yana valley, while an important new gold-mining industry has developed within

the last few years in the mountains of the upper Kolyma. The mining region is connected by a new motor road with the port of Nogayev and the small town of Magadan on the coast of the Okhotsk Sea (see p. 325).

Verkhoyansk, situated on a terrace of the right bank of the river Yana, is the most important settlement of the whole region. It has a population of several hundred and possesses such elements of civilization as a post-office and wooden buildings with large glass windows, a club, library, school, hospital, restaurant, and agricultural station. It is the chief centre for the collection of furs and mammoth ivory, which are sent by the winter sledge route over the mountains to Yakutsk. In summer steamships from Vladivostock visit the settlement. Within the last five years tin mines have been opened near the town, and in 1941 the population of Verkhoyansk and the surrounding district had grown to about 5000.

The Middle Lena and its Tributaries

Along the wide valley plains of the Lena above its junction with the Vilui, in the valleys of the Vilui and the lower Aldan, both cattle-rearing and agriculture have made rapid progress. The Yakuts have for long cultivated small fields, mainly in the steppe 'islands' which are found on the river terraces. By 1930 there were more than 100,000 acres¹ of land under crops, which were divided as follows:

	<i>Acres</i>
Barley	40,775
Rye	35,815
Wheat	15,561
Oats	10,880

The growing season lasts for ninety to a hundred days, grain being sown at the end of May, and drought presents a serious problem to the farmer. There are also spring and autumn frosts to contend with. The warm summer days and

¹ By 1936 the area of land under cultivation had risen to 250,000 acres. (For the acreages of the various crops, see table at pp. 222 and 223.) In 1938 the Yakuts had 392,000 head of cattle and 162,700 horses.

long hours of sunlight partly compensate for these difficulties, which have been overcome by the use of drought-resistant and frost-resistant plants. The new industrial settlements are now supplied with all the potatoes and vegetables they need from local farms.

There are to-day four large state farms and a number of tractor stations in this area, a clear reflection of the development of agriculture on modern lines. The Yakut no longer keeps his farm animals in his dwelling during the winter, but erects heated stables for them. There is now no necessity to slaughter a large part of the stock in the autumn, since there are ample reserves of fodder to last throughout the winter.

The development of agriculture is proceeding together with the development of industry. The Lena coal basin is second only to the Tungus basin in size, and in 1935 18,000 tons of brown coal were mined and either used locally or sent down the Lena to Tixie Bay, the port on the northern sea route. Although the output is small, it is sufficient to meet the present local requirements. The mines are situated in the Vilui basin (see Fig. 32) and near the junction of the Vilui with the Lena. There are also mines close to the town of Yakutsk, which supply the Yakutsk electric power-station with fuel. The total annual output of the Yakut coal-mines had risen by 1938 to over 60,000 tons.

Iron is mined in the Vilui,¹ Lena, and Aldan valleys. There is a considerable output of gold from the upper Vilui district, and rock salt is also obtained from the same area. The Yakuts must have known of the existence of iron ore deposits for centuries, since they have long been renowned for the excellent knife blades which they fashioned from iron obtained in the hills.

Considering the vast potential resources of timber which exist in Yakutia, the forests still remain almost untouched. The lumber industry has shown considerable signs of development, however, within recent years, and a number of saw-mills and wood-working plants have been constructed. Much

¹ The Botom iron-works have an annual capacity of 250,000 tons of pig-iron.

has been done to regulate the fur trade by means of organizing trading-stations, farms for the breeding and preservation of fur-bearing animals, hunting 'collectives,' and so on. Fishing has now become an important occupation, with the construction of fish-canneries, while the rearing of cattle is carried on not only to maintain a supply of meat, but also to provide raw materials for the tanning industry.

The growing economic importance of this remote part of Eastern Siberia is reflected in the growth of the administrative centre of the Yakut Republic, Yakutsk. The population now exceeds 25,000. It possesses saw-mills and wood-working plants, and is the agricultural centre for the whole region, as well as the chief collecting centre of the fur and mammoth ivory trade. Its position as the geographical centre of the republic has already been described. It has been considerably enhanced by the construction of an airport, and the new motor road to the south (see p. 323). Its situation in the centre of an agricultural district is remarkable when one considers that the mean annual temperature is about the same as that at the top of Mont Blanc.

The native Yakut people have been quick to adapt themselves to new ways of life. Wooden houses, similar to those of European Russia, are now more common than the primitive *jurta* in the settlements of the middle and upper Lena and its tributaries. In Yakutsk the Russian type of clothing is worn, and there are many Yakut doctors, lawyers, clerks, and engineers.

Viluisk is a smaller town. It is the centre of the iron, coal, gold, and lumber industries of the upper Vilui basin.

*The Valleys and Plateaux of the South*¹

The Upper Lena Valley. The upper valley of the Lena is narrow, so that agriculture is limited to relatively small areas,

¹ Above its junction with the Vitim, the Lena valley and the western part of the southern plateaux lie within the Irkutsk Region and Buryat-Mongolian A.S.S.R. The southern part is included in the Chita Region. The new motor roads and railways and the navigable waterway of the upper Lena are obviously orientating the economy of these regions towards the Trans-Siberian Railway and Southern Siberia (see pp. 355, 356).

and trapping and lumbering are the main occupations. The valley is, however, of considerable importance as a highway between Irkutsk, on the Trans-Siberian Railway, and Yakutsk.

Kachug, 150 miles north of Irkutsk, is the first trading station between the two towns, and is an important point for the concentration of cattle which are bought and sold here. Owing to the shallowness of the channel in the autumn large rafts are used to convey goods down the river. They are of a triangular shape, and about 70 feet long. Up to 30 tons of cargo are carried on one of these rafts, which are steered by a large oar worked from the stern. Rafts and barges crowded with cattle and shaggy yak are a common sight during the summer. In winter the river steamers, large double-decked vessels, remain at the river port of Zhigalovo, a little way below Kachug. There is a ship-building and repairing yard at this town.

Below Zhigalovo there is a wood-working plant and another ship-repairing yard at Kirensk, a relatively large settlement, with red brick buildings in addition to the usual wooden constructions. Yakut traders still come to the town to sell maral horns, which are exported to China. Near the town there is a large state farm.

Another settlement of some importance is Verkholsensk, the administrative centre for the upper Lena. Finally, where the river valley broadens out and joins the Vitim there is the town of Vitimsk.

The Vitim-Olekhma-Aldan Plateaux. The plateaux and valleys of this region, together with the Lena valley to the north of the plateaux, constitute the most important gold-producing region of the U.S.S.R. The settlements are all mining villages, or fur-trading posts and centres for the gold industry, which employs 15,000 people.

Svetloye is an important gold-mining settlement of the Vitim-Olekhma Plateau. Bodaibo is the administrative centre for the district. It is a small town composed of brick and larchwood houses and a 'waterfront' along the Vitim river with busy landing-stages, cranes, offices, and warehouses. The population, which has greatly increased with the expan-

sion of the gold-mining industry in recent years, is now about 25,000.

Higher up the valley Nadezhninsk is the headquarters of another mining district and a centre for the fur trade. It has been described as a veritable city of office buildings, stores, houses, and workshops.

There are also deposits of iron in the hills above the valley.

Tommot and Aldan are important settlements in the Aldan gold-producing region. Aldan is a relatively large town, with many new two-storied houses, and a new theatre. The motor road from Never to Yakutsk passes through it (see below). Olekhminsk is a small settlement near the junction of the Lena and Olekhma valleys. It lies on the shortest route from the Lena to the Amur basin.

THE PROBLEMS OF TRANSPORT AND LABOUR SUPPLY

Owing to the sparse population the timber and mineral resources of the Yakut Republic have been developed only to an insignificant extent. Although covering an area of about three million square miles, the republic supports a population of less than half a million. Of this number some 79,000 live in urban settlements. About a third of the entire population is concentrated in the settlements in the valleys of the south, owing to the greater possibilities for agricultural development, and the proximity to the Trans-Siberian Railway.

Formerly, however, winter sledge tracks and the rivers in summer provided the only means of transport. There is no through waterway to the railway. Without a better system of transport the colonization of the country and the export of its wealth remained impossible.

Earth roads have recently been constructed from Yakutsk to Vitim, Viluisk, Verkhoyansk, the Kolyma valley, the small Pacific port of Okhotsk, and Rukhlovo, on the Trans-Siberian Railway. Other roads connect Kirensk, at the head of the Lena navigation, with Irkutsk. A motor road 620 miles long has been built along the Lena and Aldan valleys, between Yakutsk and the Amur valley. From the station of Never,

on the Trans-Siberian Railway, to the town of Aldan the journey by motor-car takes 18 hours, as compared with the winter sledge journey of 20 days. It is not known how far the construction of railways has proceeded in the south. In 1937 a line from Taishet, 270 miles east of Krasnoyarsk, around the northern end of Lake Baikal to the Amur valley, at Komso-molsk, was under construction, and it was planned to continue this to the Pacific port of Soviet Haven, east of Khabarovsk. When this line is completed it will provide a northern alternative to the present Trans-Siberian line, and may be connected to motor roads or railways along the valleys which run northward towards the Lena. The entire Lena basin is now served by a regular system of airways (see Fig. 70), while the northern portion is served by the new and well-equipped port of Tixie Bay, at the mouth of the Lena.

North-eastern Siberia

The north-eastern extremity of the U.S.S.R. offers a number of interesting contrasts with the north-western extremity, the Kola Peninsula. North-eastern Siberia is the most remote part of the Soviet Union, far removed from all centres of population, and is itself inhabited by less than a hundred thousand people. Unlike the Kola Peninsula, it is served by no large port or railway. On the contrary, it is separated from the neighbouring republic of Yakutia, itself a remote region, by lofty mountain ranges, so that communication with the rest of the Soviet Union can only be maintained by steamship services from Vladivostock. These lines have to serve a coastline with a total length of 10,000 miles between Vladivostock and Providence Bay, and an additional two or three thousand miles between Providence Bay and the mouth of the Kolyma river.

The proximity of the region to the Pacific Ocean brings only slight amelioration of the severity of the Siberian winter, and this is more than offset from the human point of view by the prevalence of raw, damp, stormy weather, for in place of the warm waters of the Gulf Stream Drift which wash the

shores of the north-western extremity of the Soviet Union, the ice-cold waters of the Arctic Ocean penetrate through the Behring Strait into the Pacific, to form cold currents offshore, which considerably cool the climate, especially in summer. In winter cold, dry, anticyclonic winds blow from the interior of the land mass. In summer the cold currents cool the winds from the sea and cause fogs, rain, storms, and squalls.

The Tundra zone penetrates farther to the south than elsewhere in Siberia. Snow begins to fall in October and lies on the ground until the first week of June, or even later.

The region may be divided as follows: (1) the narrow coastal plain of the Okhotsk Sea, north of the mouth of the Amur; (2) the Kamchatkha Peninsula; (3) the Chukhot Peninsula, divided by the Anadir Range of mountains into the Kolyma and Anadyr basins. The entire region is separated from the Yakut Republic by the Dzhug-Dzhur and Kolyma Ranges, which run close to the coast.

THE COASTAL PLAIN OF THE OKHOTSK SEA

The plain is very narrow, being bounded on the west by high mountains which in some places come down to the shore with steep rocky slopes, or cliffs. The coast itself is exceptionally straight, with few bays or natural harbours. The sharp, cold, rain-bearing winds of summer create conditions much more difficult for human activity than the more continental climate of Yakutia. In winter the sea is frozen.

The native Lamuts, who belong to the Tungus group of peoples, fish, hunt seals, breed reindeer, and engage in the fur trade. Gold is found near the small ports of Okhotsk and Ayan. In recent years a rich gold-bearing district has been developed in the upper Kolyma region. It is connected by a motor road with Magadan, and a new port on Negayev Bay.

KAMCHATKHA

The Kamchatkha Peninsula is about 750 miles in length. It consists of two parallel ranges of mountains separated by

a wide central depression. The peninsula is composed of ancient rocks, covered by Tertiary deposits in the north. The whole region was greatly eroded and the surface levelled down in ancient times. But the river system was rejuvenated by an elevation of the land during the Pliocene period. This recent Tertiary upheaval is reflected in the present existence of more than sixty volcanoes, seventeen of which, situated in the eastern range, are still active. The most prominent of all is the snow-capped giant Kliuchevskaya, which rises to a height of nearly 16,000 feet. Above 5850 feet all the mountains are snow-covered, even in summer. Near the volcanoes there are numerous hot springs.

Although the climate is somewhat milder than that of the previous region, it is much more severe than that experienced in similar latitudes in European Russia. The western shores experience the longest and coldest winters. The snowfall is relatively heavy, commencing in October.

Along both the western and eastern coasts there is snow, rain, or fog on most days of the year. From October to April the *purga* is an almost daily occurrence. In summer stormy, changeable weather, with rain and fog, is common.

Most of the northern part of Kamchatkha is covered with vegetation of the Tundra type. Except on the highest slopes of the mountains the remainder is forested. There are magnificent forests of spruce in the south, where the appearance of the country is similar to parts of Sweden. The larch and pine are also common. Along the coast, the stormy, damp nature of the climate causes the thick forests of the mountain slopes to give way to dwarf birches and Tundra. Many parts of the coast are rugged, bounded by steep mountain slopes and cliffs. On the narrow beaches drifts of snow may be seen even in the middle of June. There are some excellent meadows with tall, thick, luscious grass in the central depression. Agriculture is limited to the south of the peninsula, and even here it is extremely difficult, if not impossible, to grow wheat.

In the mountains there are flocks of hundreds of wild mountain sheep. The forests are inhabited by bears and sable, the fur of the latter being of great value. But although

hunting is an important occupation, the salmon is the very basis of life in Kamchatkha. It has, indeed, been described as Kamchatkhan bread. The rivers teem with this fish. It is the main article of food for both man and dog, while within recent years it has become the basis of an important fish-canning industry.

Seals and whales abound in the coastal waters and provide the basis for another new industry.

Human Activities

The mountains and the upper slopes of the valleys around the central depression are inhabited by Koryaks and Lamuts. The Koryaks are in the main a nomadic people. Those who have settled engage in hunting and fishing. The salmon is the chief article of food. The majority, however, are nomadic reindeer-breeders, possessing herds of great size, often containing two or three thousand animals. The people dwell in *yurta*, large tent-like constructions, consisting of reindeer-skins stretched over a light wooden framework, and divided into several compartments by means of skins, which are also spread over the floor.

In the centre of the *yurta* there is a fire over which hang enormous metal pans. Here the meals are cooked. The tongue of the deer is regarded as a great delicacy, while sausages are made from the intestines and fat, and congealed blood is made into a sort of porridge. These people are great tea-drinkers.

The reindeer are pastured on the lower mountain slopes in winter, but in summer they are taken up into the high fells. When all the *yurta* have been dismantled and packed on sledges, together with all the domestic articles, a most impressive caravan is formed. When a new 'camp site' has been established the deer are driven away into the hills to graze. The Koryaks never ride their animals, using them solely as a source of food, and to draw the sledge.

The Lamuts inhabit the valleys in the mountains of the centre and north of Kamchatkha. Their herds are generally

smaller than those of the Koryaks. In contrast to the latter, the Lamuts ride the reindeer, use both deer and dogs as draught animals, and engage in hunting in addition to reindeer breeding. Their sledges are made entirely of birchwood, the various parts being bound together with leather thongs. Thus, should any part break, it can quickly and easily be replaced, while the whole sledge is extremely strong and flexible. When a tribe is moving from one place to another as many as sixty reindeer may be used to carry the people and their belongings. The men go up into the fells to round up the herds. All the belongings are packed into sacks and fastened on to sledges or on to the backs of the deer. A typical caravan consists of three dog-sledges, followed by four reindeer-sledges, carrying people, five baggage-sledges and groups of pack-animals bringing up the rear.

In the spring the furs of the animals which have been caught in the hunting season are taken to the trading-posts, where they are sold, and tobacco, tea, flour, etc., are purchased.

The Kamchadalis are a settled people. They live in wooden houses, grouped together in small villages, which are almost always situated by the side of a river. The reason for this is that in addition to hunting and trapping, and the dressing of reindeer-skins, fishing is a most important occupation. The extent to which the life of these people is dominated by the salmon fisheries is shown by such phrases in their language as "The people were as thick as salmon"—a common method of describing a crowd.

Salmon and tea are the main items of food, with the addition of an occasional dish of stewed mountain mutton.

Every house has a fish-drying shed attached to it, and the smell of fish in the villages is overpowering. The street of each settlement is crowded with dogs, two or three hundred of them being no uncommon sight. Every man has at least a team of ten. If a Kamchadali wants to indicate that his neighbour does not often entertain visitors he will say that there are never any dogs outside his house.

Although some agriculture, especially the rearing of cattle and horses, is carried on in the south, it is probably true to

say that the salmon and the sable form the basis of life for the majority of the people.

The hunting and trapping season extends from October to March. In the autumn, when the snow is not deep enough for the use of the dog-sledge, the hunters set out on horseback, taking with them guns, traps, skis, a tent, and food. By November, however, the sledge is in use. Using their camp as a centre, the men set out in search of tracks. When the hole which indicates the retreat of the sable is found a net is pegged around it and the hunter commences to dig with a wooden spade, until finally the animal dashes out, is trapped in the net and killed by the dogs. Wooden and steel traps are also set to catch the sable.

At the beginning of spring the hunters return to their village with the sable-skins, and usually some fox, ermine, otter, and hare. Bear-hunting is carried on in spring and late autumn.

Settlements, Population, Agriculture, and Industry

In the southern half of Kamchatkha there is a large number of small settlements, strung out along the Kamchatkha valley in the central depression, and along the valleys of the west coast. Klutchi, one of the largest, has a population of 500, composed of Russians, Chinese, and Koreans, in addition to Kamchadalis. It is the centre of the fur trade, an exceedingly busy place, with sledges coming and going all day long, some loaded with furs, others with supplies of meat—carcasses of wild mountain mutton. Milkovai is a village of similar size. In these villages there are usually a number of horses, as well as the usual crowds of dogs. Spring is the busy season. There is a continual flow of traffic between the settlements, as the furs are taken to the trading centres. Convoys of twenty sledges are a common sight along the valley tracks, which may be described as the main roads of Kamchatkha.

Large mechanized canneries have been established in connexion with the salmon-fisheries. At Nizhni Kamchatsk, a big Russian settlement on the flat, treeless delta of the Kam-

chatkha river, there are three large canneries, which employ more than 2000 workers during the summer. The Kamchatkan fish industry is now second only to that on the shores of the Caspian Sea.

The sealing and whaling industries have been modernized by the introduction of a fleet of mechanized 'factory ships.' The fur industry has been organized by the institution of state animal-breeding farms, reservations and hunting 'collectives.' In the south agriculture has been developed to such an extent that Kamchatkha can now boast of several herds with a thousand or more head of cattle in each.

Until oil was discovered in the peninsula there was no large-scale industry. To-day oil-wells are operated on the east coast, and, together with coal from the deposits which have been opened up in the north of the peninsula, will play an increasingly important part in the industrialization of the Amur basin and the Vladivostock district.

The administrative centre and chief port for the whole region is Petropavlovsk, situated on the north shore of Avatcha Bay, in a short narrow valley, surrounded by mountains, forests, and luscious meadow lands. It is an air and naval base, with new ship-building yards, and a large fish-canning factory. The influx of settlers into Kamchatkha has been remarkable. Between 1930 and 1933, 15,000 colonists came into the region, obviously reflecting the great economic development which has taken place.¹

Like the whole of the north-eastern extremity of the Soviet Union, Kamchatkha is connected with the rest of the country by the sea route to Vladivostock, which lies some 1500 miles away to the south.

THE CHUKHOT PENINSULA

The Anadyr Basin

The Anadyr basin lies between the Kolyma, Anadyr, and Kamchatkha mountain ranges—lofty mountains which were folded in Tertiary times. The whole region lies within the

¹ The population in 1933 was 28,000.

Tundra zone, with the usual vast areas of marshes during the summer.

Some Eskimos live near the Behring Strait. Elsewhere the people are Chukchis, reindeer-breeders who migrate with their herds to the coast in summer. Steamboats visit the bays, and supply the trading-posts with various commodities. There are very large herds of deer in this region, and, together with those of Kamchatkha, they constitute about a half of the total deer population of the Soviet Union.

Some of the Chukchis, however, lead a more settled life, hunting in the winter, and fishing and hunting seals and walrus during the summer. They use the dog in place of the reindeer as a draught animal.

Apart from the Chukchis and Eskimos, there are a few Russians at the trading-posts and educational stations.

Near the Behring Strait there are valuable deposits of gold, silver, zinc, lead, and graphite. In the Anadyr valley, and to the south of the port of Anadyr, coal is mined and supplies the ships of the Arctic sea-route.

The Upper Kolyma Valley

This region is of importance since the new gold-bearing area was opened recently (see p. 325).

The Chukhot Peninsula now constitutes the Chukhot National Region, with a population of about 15,000.

CHAPTER X

The Far East

The Amur-Ussuri Basin

PHYSICAL CHARACTERISTICS

THE Amur-Ussuri basin may be divided into two main regions, known as the Pre-Amur and Primorye regions.

The Pre-Amur Region

This region extends from the Bureya Mountains in the east to the junction of the Shilka and Argun rivers in the west. To the north are the parallel Tukuringra, Dzhagdi, and Stanovoi Ranges. The Amur forms the southern boundary and also the Soviet frontier. Within these boundaries lies the Zeya-Bureya Plateau, cut by the Zeya and Bureya rivers, which flow in a south-westerly direction to the lowland of the Amur valley. These two rivers have cut deep into the plateau, and in their course towards the Amur have a considerable fall, so that the current is fairly swift.

The Primorye Region

Primorye is a region occupying the basin of the Amur below its junction with the Sungari tributary. The Ussuri valley and the Amur valley together form a long strip of lowland extending from Lake Hanka in the south to the mouth of the Amur in the north. South of Lake Hanka it is continued in the Prikhana Lowland in the Vladivostock district. To the east of this depression the Sikhote Alin Range rises with gentle slopes. But on the Pacific side of the range the mountains fall steeply down to the coast. The streams are short and swift, while the coast itself is generally rocky and steep, with few bays or natural harbours. The Sikhote Alin and the coast may be included in this region, although

their rôle is rather of a negative nature, from the point of view of human geography.

The Amur plays the most important positive rôle. It unites Primorye with the Pre-Amur region. It is a navigable

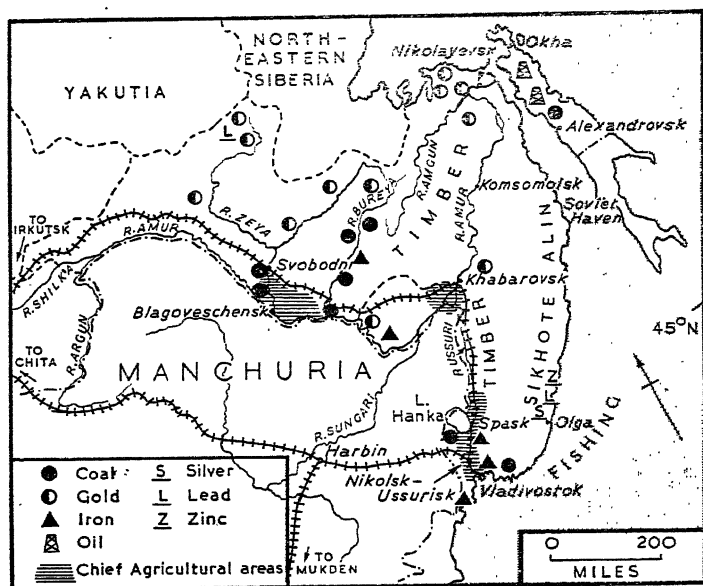


FIG. 34. THE AMUR-USSURI REGION

waterway flowing through the chief part of the Far East which has any considerable agricultural potentiality. North-eastward along the main valley there is a through route around the northern end of the Sikhotealin to the Pacific, while the Ussuri valley and the Prikhanka Lowland provide a route around the southern end. Along the upper Amur the Trans-Siberian route links the Far East with the agricultural and industrial regions of Southern Siberia. The importance of the Amur is so well recognized that the Russians have called it the Volga of the East.

Since the subsoil of the land to the north of the river is for the most part permanently frozen, very little of the melting snow and ice of spring, or of the rains in summer, sinks into the earth to become ground water. Consequently there is no natural storage of water in the earth, since practically all of it runs straight into the rivers, giving the Amur a great volume, but causing it to become rapidly shallow in the dry autumn months.

The Amur originates in the junction of the Shilka with the Argun, rivers which are closely hemmed in by wild forested mountainous country. Apart from the difficult autumn period these rivers are navigable, and river steamers can pass along them and their tributaries for great distances during the season, which lasts for approximately 160 days. The total length of navigable waterways is over 3000 miles. The river Zeya alone is navigable for 600 miles (see p. 65).

Five hundred miles from its mouth the Amur has a width of a mile and a half. At the mouth it broadens out to about ten miles, but a sandy bar across the entrance prevents the larger ocean-going steamers from proceeding up the river.

The lower courses of the Zeya and the Bureya, the Amur below its junction with the Zeya, and its right-bank tributary the Ussuri, flow through broad lowlands which are rapidly becoming rich farmlands. The ancient mountains and plateaux which lie to the north, fractured during more than one geological period, and considerably eroded and worn away and dissected by the action of rivers, contain rich mineral resources—gold, coal, iron, etc., thus providing the basis for recent industrial development.

The low, gentle slopes of the western approaches to the Sikhote Alin are composed of tectonic valleys and smooth, rounded, eroded hills, bearing evidence of the influence of Tertiary earth movements upon a more ancient and denuded highland mass.

Although the main routes to the Pacific follow the Amur-Ussuri depression, to proceed around the extremities of the Sikhote Alin Range, there are a number of fairly low passes across it, well known to the native hunters and trappers.

The Veriukha Pass provides one of the most convenient routes, crossing the mountains at a height of about 1500 feet. The mountain valleys are often of the ravine type, and on all sides there is clear evidence of dislocation and fracture during the Tertiary period.

CLIMATE AND VEGETATION

The transitional nature of the climate between the typically continental type of Eastern Siberia and that of Manchuria and China to the south has already been described in Chapter II.

The influence of the monsoons is obvious. The winter, almost snowless, is dry, cold, and clear, the spring cold and windy. Summer is exceedingly warm, damp, and oppressive, more than 50 per cent. of the annual precipitation falling as heavy rains during July and August. Autumn is generally clear, dry, and warm. But typhoons sometimes occur in the southern part of the Ussuri valley. Near Lake Hanka a sudden storm may occur at the end of a warm, calm autumn day. A black fog appears on the horizon, gradually rising higher until the evening sun is completely blotted out. The rising wind chases clouds across the sky and finally drops suddenly as snow begins to fall. Later in the evening a blizzard rages with unbelievable force. Next morning, however, the air is fresh and clear, and the sun shines down upon a countryside clothed with a thin white mantle of snow.

The Sikhote Alin is a climatic divide, which to a great extent limits the influence of the Pacific Ocean to the coast. The view from the mountain passes often gives striking confirmation of this fact. To the west the sky may be clear and bright, while in the east the higher mountain peaks project like islands in a sea of fog. Drizzle and mist are very common along the Pacific slopes. In autumn there are sudden storms during which the rivers become raging and torrential floods carrying away the banks and giant trees. In October there are frequent sharp frosts and blizzards.

Climatically the annual isotherm of 32° F. divides the

Far East into a colder northern part, lying to the north of the Amu-Ussuri Lowlands, and a warmer southern part, which mostly lies outside the limit of permanently frozen subsoil. The July average temperature rises to 72° F. along the Soviet-Manchurian frontier. Thus, climatically as well as physically, the river lowlands are the most suitable for agricultural development.

The contrast between north and south is strongly reflected in the natural vegetation. In the north coniferous forests prevail, in the south deciduous forests. The valleys of the Amur and its tributaries contain excellent alluvial and meadow soils. The valley bottoms are clothed with rich meadows where the grass grows so high that it is possible to become lost in it. One traveller, describing this experience, wrote that he felt "drowned in grass."¹ These rich meadows could, indeed, "provide pastures upon which the cattle of the world might graze."

On either side of the meadows there are immense parklands ablaze with the colour of the yellow lily, honeysuckle, and buttercup, and hillsides covered with open woods for hundreds of miles. The slopes of the mountains, the higher land, and the sides of the narrower valleys of the upper sections of the rivers are thickly forested.

The great variety of trees, and the dense undergrowth which gives much of the southern forest land a tropical appearance, with a great profusion of flowering plants and giant ferns, have been described in Chapter IV. In the Sikhote Alin Range, and in the northern coniferous forests where the subsoil is permanently frozen, the roots of the trees are forced to spread out not far below the surface. Consequently many of them are blown down during storms, creating great difficulties for travel in the forests.

The variety of trees in the south is accompanied by a similar variety of wild animals and birds. The thick grass of the valley lowlands forms the home of enormous flocks of geese, tern, teal, and duck. In the swamps and thickets near

¹ See *Dersu the Tracker*, by V. K. Arseniev (Secker and Warburg, 1939), for an excellent account of the Ussuri basin.

the rivers there are wolves, foxes, polecats, hares, otters, and many other animals. On the mountain slopes wild elk and deer and wapiti are found. The oak forests are the feeding-grounds for great herds of wild pigs, the numbers of which are kept down by the Ussuri tigers. The valleys are the haunts of the bear. Of the many fur-bearing animals the sable is the most valuable.

HUMAN ACTIVITIES

The lowlands of the Amur basin are favoured by warm summers and relatively good soils, while the plateaux and mountains provide a great wealth of timber and minerals, and the rivers and coastal waters contain a great variety of fish. The region has good communications with both Southern Siberia and the Pacific coast, by means of the navigable waterways and the Trans-Siberian Railway. It is served by Russia's chief Pacific port, Vladivostock, and the smaller ports of Nikolayevsk and Soviet Haven. It is probable that the two latter ports are now connected with the Trans-Siberian Railway by new lines described below.

It is possible to compare the position of Leningrad, the western port of the Soviet Union, with Vladivostock, its eastern port. Leningrad, together with Murmansk and Archangel, serves a vast portion of the northern lands of the U.S.S.R., rich in timber and minerals, although with limited agricultural possibilities. Archangel and Murmansk are terminal ports for the Arctic sea-route. Vladivostock, with Nikolayevsk and Soviet Haven, serve the Far East, also rich in minerals and timber, while Vladivostock itself is the centre of sea-communications with North-eastern Siberia and the Kolyma valley, besides being the eastern terminus of the Arctic sea-route.

Both regions, the north-west and the north-east of the U.S.S.R., are connected by rail with the chief centres of population. But in the case of the Far East the length of that connexion is enormous, and this remoteness, together with the fact that it is naturally orientated towards the Pacific,

has led to the recent development of the Far East as an almost self-subsistent agricultural and industrial area. In this development strategic considerations have also played an important part, for in the case of war with her eastern neighbours the Far East would be difficult to defend had all supplies to be brought overland for great distances along the Trans-Siberian line (over 5000 miles from Moscow).

The Pre-Amur Region

Agriculture. Within the last fifteen years many new settlers have come to this region, and in spite of such difficulties as the dry spring season and the heavy summer rains, the compensating factors of the warm summers and the rich valley lowlands have made it possible to increase the number of cattle and pigs and the acreage of crops.

The cultivation of the soil and the rearing of cattle are carried on along the entire valley of the middle and upper Amur. But above Svobodni, in the Zeya valley, and some distance west of Blagoveschensk in the Amur valley, as the lowlands become narrow, more restricted, and hemmed in by the forested slopes, hay production, cattle-rearing, and the growth of small crops of flax become the main occupations, finally being replaced by lumbering, trapping, and hunting. Similarly, below the Amur-Bureya junction, although crops are grown, cattle-rearing on the valley meadows is of primary importance.

Everywhere the higher land of the mountains and plateaux are the domains of the trappers, hunters, and lumbermen.

The most intensive development of the cultivation of crops has taken place in the broad lowlands which lie between the junctions of the Zeya and Bureya rivers with the Amur, and along the lower parts of the two former rivers. Wheat is the main crop, while oats occupy a considerable proportion of the sown area, and some sugar beet, barley, and rye is grown.

Cultivation is mainly on large mechanized state farms, very necessary in view of the low density of population, and the

consequent shortage of labour.¹ Pigs and sheep are the most important farm animals, although there are also large herds of cattle.

Industry. The valleys of the upper Zeya and Bureya, as well as the plateau between the two rivers, are rich in gold,

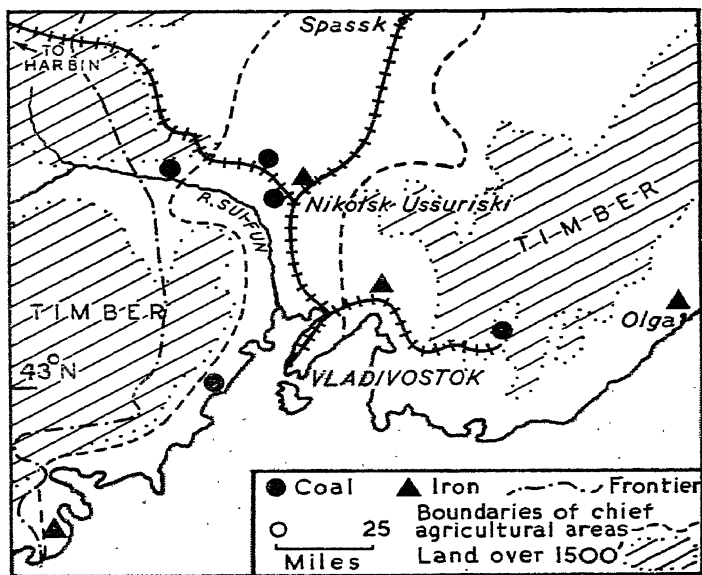


FIG. 35. THE POSITION OF VLADIVOSTOK

while lead is mined in the extreme north of the Zeya valley. Coal is now mined near the southern end of this valley, between Svobodni and Blagoveschensk, and also at several points along the Bureya valley (see Fig. 34). From the latter excellent coking coal is obtained, and this has made possible the rapid expansion of the new iron and steel industry at

¹ Throughout the whole of the Far East the average size of a collective farm in 1940 was about 11,500 acres, and tractors and combine-harvesters were used in 90 per cent. of the major agricultural operations. Nearly three million acres were cultivated in 1937.

Khabarovsk. Local iron resources in the Amur valley and the Little Khingan Mountains are now being worked.

Population and Settlements. Vast areas still remain almost unpopulated, and peopled by a scattering of native hunters and trappers, mainly Evenkis (Tungus) but with some Golds in the Amur valley.

The most densely populated area is the new agricultural and industrial region described above. Coal-mining, metal-lurgy, lumbering and wood-working, flour-milling, tanning, leather, and butter manufactures are the main industries.

Russians and Ukrainians form the largest section of the population. The smaller towns and villages consist of single-storey buildings of wooden construction, the gentle slope of the roofs showing clearly that there is no fear of heavy snowfall during the winter. The largest and most industrialized town is Blagoveschensk, with a population of 58,761 in 1939. Situated in the midst of fertile meadowlands, cornfields, and forested hillsides, on a branch line of the Trans-Siberian Railway, this town contains some wide modern streets, with large shops and high blocks of stone buildings, in addition to the prettily painted and artistically carved and ornamented timber bungalows of the suburbs. It is the chief flour-milling centre of the Far East, and contains agricultural engineering works.

Primorye

In the basin of the lower and middle Amur and in the Ussuri basin hunting, fishing, and lumbering are of great importance. Timber from the coniferous forests to the north of Khabarovsk is carried down the Amur to the port of Nikolayevsk, and there is a small export from Soviet Haven. The most intensively developed forest area, however, lies between Khabarovsk and Vladivostock, where there is an abundance of many kinds of valuable deciduous trees of great girth and height, within easy reach of the latter town, which is the chief exporting centre. Between the Ussuri river and the slopes of the Sikhote Alin there are numbers of lumber camps and saw-mills.

The native hunters and trappers are Golds and Orotchis.

They hunt and trap the sable, lynx, marten, and squirrel. Typical Gold trappers and hunters dress in deerskin jackets and breeches, with elk-skin moccasins on their feet, and a scarf around the head. They are broad, thick-set people, with high cheek-bones, small noses, and slanting eyes with the Mongolian eyelid. Many of them never live in a house, and sleep in the open, by a camp fire, even in the severe frosts of winter. They are accustomed to making long journeys across the mountains and through the forests, their whole existence depending upon their ability to use a rifle, their skill in tracking and knowing the ways of animals and being able to forecast the weather.

In the mountains there are small wooden huts in which they take refuge from storms, and it is an unwritten law that when a man visits one of these cabins he must leave behind a store of wood, matches, and rice for the next visitor.

During the autumn the Golds and Orotchis engage in the hunting and trapping of the wapiti. Blowing a long horn made from birch-bark, they attract the animals within shooting range. Sometimes fences, which may be up to nine miles in length, are constructed across a valley, to trap the animals when they are young. They are then kept in rough wooden cages until the antlers have matured. The hides, antlers, and tendons are sold to the Chinese.

In the southern forested slopes of the Sikhote Alin and in the Ussuri valley there are groups of Koreans and Chinese, many of them mixed with the original native stock. The Koreans live in huts made from cedar-bark, the roof being thatched with grass. They engage in fishing and sable-trapping. One of their favourite devices for catching the sable is a log, placed across a stream, and with a wooden fence constructed as an obstacle about half-way across. This fence contains a hole with a noose in it, attached to a stone, so that when the sable attempts to get through the hole he is caught in the noose, falls into the water, and is kept on the bottom of the stream by the weight of the stone, to prevent the crows from pecking at his body and destroying the skin. Some of these mixed peoples live in wigwams. The Chinese,

however, usually live in small clay-covered cabins. Before the Russian Revolution they were the traders, making many a hard bargain with the hunters, who got everything on credit from them, repaying their debts with furs and wapiti antlers.

These traders were relatively prosperous people, and around their cabins there were plots of maize, wheat, and millet (which were often uprooted at night by the wild pigs from the near-by forests). Near the cabin was a shed for the storage of antlers, and outside it skins were stretched out to dry. To-day all trade must be carried on through the State 'Co-operatives.'

There is an abundance of fish, particularly salmon, in the rivers, and fishing has always been a valuable source of income to the peoples of the Ussuri-Sikhote Alin area. To-day, both river and sea-fishing, as well as hunting, have been organized by the establishment of 'collectives.' In this way it has been possible to regularize these occupations in such a manner as to prevent the gradual killing off of both animals and fish. The whole of the Far Eastern fisheries have been completely modernized during the last fifteen years, and are now well equipped with trawlers, floating canneries, motor-boats, etc. The export of canned fish is of great importance. About a quarter of the total catch of fish in the U.S.S.R. (a total of 1.6 million tons) comes from the Far East (see also p. 593). Vladivostock is an important centre for the sea-fisheries and for fish-canning. At Nikolayevsk, the centre for the Amur fisheries, Soviet Haven, and Vladivostock the mechanized canneries produce 180 million tins of preserved fish each year (excluding the floating crab canneries).

As elsewhere in the Far East, farming is confined to the valley lowlands. There are three agricultural regions which are likely to become of considerable importance: the Amur Lowlands around Khabarovsk, the upper Ussuri valley near Lake Hanka, and the Prekhana Lowland, between this lake and Vladivostock.

In the district around Khabarovsk rye and wheat are the main crops, and, as in the Zeya-Bureya region, they are grown

chiefly on large mechanized state farms. Pigs and cattle are reared in considerable numbers.

The warmer climate of the southern part of the Ussuri valley and the Prekhana Lowland creates the most favourable conditions for agricultural development in the whole of the Far East. In the past the soil was cultivated mainly by Koreans, who also kept horses and cattle. They lived in small cabins surrounded by cultivated fields and gardens. As of old, the Korean villages to-day are spread out over a square mile or more of land, since there is no lack of water, and no need to concentrate the houses at one particular spot. Instead, each cabin stands amid its own plot of land. Like the Chinese, the Koreans cultivate maize, millet, and wheat.

Since the establishment of state and collective farms the acreage sown to these crops has been greatly increased, a necessary step in order to provide food for the growing industrial population of the towns. The acreage of sugar-beet is increasing year by year.

In the Prekhana Lowland large areas are devoted to 'Chinese' crops such as rice, soya bean, and kaoliang, a kind of millet.

Industry. Khabarovsk and Vladivostock are also the centres of new industrial regions. Oil from Sakhalin, coal from the Bureya basin, iron from the Little Khingan Mountains, the Amur valley and mines to the south of Lake Hanka, provide the raw materials for heavy industry.

Khabarovsk has been described as the metropolis of the Far East. It is situated at a focal point for the bringing together of raw materials and the exporting of the finished products, for it lies at the junction of the Amur and Ussuri waterways, in the centre of the depression which has an outlet at either end on the Pacific coast. It stands on the Trans-Siberian Railway at its junction with the new Amur railway, connecting Khabarovsk with Nikolayevsk. It is thus connected to the sources of coal, iron, and petroleum, as well as to the two Pacific ports.

In addition to agricultural engineering works the town possesses large new oil and petroleum refineries. It has

become the petroleum supply centre for the entire Far East, and in addition supplies are carried westward by rail to the industrial regions of Southern Siberia.

Apart from the metallurgical and oil-refining industries, there are machine-building, chemical, flour-milling, meat-packing, and leather industries in the town, all relying upon local agricultural or mineral supplies. The growth of the population has been remarkable. In 1926 there were only 44,000 inhabitants. The figure at the last census was 199,364.

To the north of Khabarovsk, in the midst of the vast forests, another town—Komsomolsk—has shown even more remarkable signs of growth. Not many years ago the site of the town was occupied by the out-of-the-way, decaying village of Permsk. In 1939 there was a town of some 70,000 inhabitants, with a wide main street, bordered by modern stone and concrete buildings, and having most of the amenities of a large west European town. The new railway lines both from Khabarovsk and from Soviet Haven to Lake Baikal have probably been completed by now, transforming Komsomolsk into an important railway junction connected with three ports—Nikolayevsk, Soviet Haven, and Vladivostock. As the mineral and timber wealth of Southern Yakutia becomes developed to a greater extent, as will certainly happen with the creation of a railway line along which to export these commodities, an increasing volume of traffic will pass through the town, and these raw materials will probably form the basis of new industries. At present iron-smelting and steel-making, machine-building, shipbuilding (river steamers) and the machine-tool, tanning, leather-manufacturing, and wood-working industries are carried on.¹ (See p. 240.)

The Vladivostock industrial area is within easy reach by sea of the coal and oil supplies of Sakhalin. Coal is also brought by rail from the Suchan and Ugolnaya mines, north-

¹ Construction may have begun on a new line, projected as early as 1938, from Komsomolsk to ports along the coast of the Okhotsk Sea. Since 1935 motor roads have been built between Vladivostock and Khabarovsk, and from the latter to Nikolayevsk and Soviet Haven. A trans-Siberian trunk road from Vladivostock to Moscow is believed to be under construction.

west of Lake Hanka. Iron is mined on the Pacific coast near the small port of Olga, and to the north of the port, near Tetiukha, there is a large refinery for rare metals such as cadmium, found in the Sikhote Alin Mountains. In Vladivostock, zinc- and copper-smelting and refining is carried on.

The first electric-power station in the entire Far East has been constructed at Vladivostock, so that the city is now well supplied both with power and with raw materials. The chemical, textile, and shipbuilding industries are the most important. Flour-milling, manufactures connected with the food industry, tanning and leather manufactures, the wood industry, and the fishing and fish-canning industries are also of major significance. The U.S.S.R. possesses enormous coastal fisheries in Far Eastern waters, and the canneries handle 200,000 tons of fish per year. The city now possesses a large modern refrigerating and cold-storage plant.

Situated in the centre of the upper Ussuri agricultural region, to the north of Vladivostock, is the town of Spassk. The beet-sugar factories of the town are designed to meet all the requirements of the Far East. Formerly all sugar was imported from the Ukraine. Another commodity which was not previously manufactured in the Far East is cement. Before 1917 it was carried half-way round the world by sea from the Black Sea port of Novorossisk. To-day all supplies come from the cement works at Spassk. Farther south, at Nikolsk, there are chemical, sugar, and food-manufacturing works, and the iron-smelting industry is being developed.

Quite apart from being an industrial centre, Vladivostock is an important naval base, the only large Soviet port on the Pacific, so that it has considerable strategic and commercial value. It possesses excellent harbour facilities, on the shores of a fine bay, down to which the main streets of the town sweep with rather steep slopes. Owing to the fact that the Sikhote Alin Range causes traffic from the west to be diverted to the north or south at the Amur-Ussuri junction, the Trans-Siberian Railway turns south at this point and has its terminus, some ten days' journey from Moscow, at Vladivostock, which in every respect is a better port than Nikolayevsk.

The latter does not possess such an excellent harbour, and it is icebound during the winter. Vladivostock can be kept open for shipping all the year round. Finally, Vladivostock is the terminus of the northern sea-route and the centre for communications with all the scattered settlements of North-eastern Siberia. The population rose from 101,000 in 1926 to 206,432 in 1939.

The Jewish Autonomous Province of Birobijan

To the north of the river Amur, between Khabarovsk and the river Bureya, a region was set apart in 1928 to be peopled by Jewish immigrants who favoured the idea of a Jewish National State. By 1933 the population was 50,000, and by 1939 it had risen to 108,419. About 75 per cent. of the people live in the administrative centre of Birobijan—a modern town, with theatre, cinema, schools, and libraries, and clothing, textile, and leather factories. The town has its own electric-power station. Coal is mined to the west of Birobijan. State and collective farms have been established, and the lumber industry developed. Gold is mined in the north-west of the Republic. Saw-mills have been established near the Trans-Siberian Railway, which passes through the north of the region, as well as large plywood and furniture industries. Railway carriage and wagon-building works supply a large proportion of the rolling stock used in the Far East.

Sakhalin

The north half of Sakhalin belongs to the U.S.S.R., the southern half to Japan. In 1875, by treaty with Japan, Russia obtained sovereignty over the entire island, as Japan obtained the Kurile Islands. In 1905 (after the Russo-Japanese War) Japan took the southern half of the island. The importance of the island lies chiefly in the resources of petroleum in the northern part—unknown when Japan left Russia in possession. At Okha, in the north, a large petroleum industry has been established, yielding 10,000 tons annually. The Sakhalin

oilfields are worked by the Russians and the Japanese on the checker-board system,¹ concessions having been granted to the latter in 1925. The Soviet output is about 361,000 tons annually.

Coal is also mined in the north (215,400 tons in 1931).

State farms supply the population with vegetables, while in spite of the raw climate several thousand acres have been sown to wheat and barley, chiefly in the Tym valley.

Coal and oil are exported through the port of Alexandrovsk. Its population is similar to that of Okha, about 18,000.

THE POPULATION OF THE FAR EAST

The population of the Far East has rapidly increased during the past fifteen years, as the figures for the population of towns described above show clearly. Nevertheless, the Far East as a whole, covering an area of more than a million square miles (13 per cent. of the entire Soviet Union), supports a population of only two millions—largely concentrated in the Amur basin, in what is popularly regarded as the Far East, although the whole of North-eastern Siberia is now included within the Soviet Far East. About 50 per cent. of the entire population is concentrated in the Bureya-Zeya, Khabarovsk, Komsomolsk, and Vladivostock districts, and about one half of the population can be classed as being of urban character.

Although thirty-six different national groups are represented in the Far East, 80 per cent. of the people are Russians or Ukrainians, and 10 per cent. Koreans and Chinese (mainly in the Primorye region). The remaining 10 per cent. consists of Evenkis, Golds, Orotchis, Lamuts, Chukhots, Koriaks, and Kamchadalis.

¹ The Japanese and Russian wells are sunk in the oilfield on a checker-board system in order to distribute them fairly and evenly over a given area. The wells are connected by pipeline to the port of Moskal-vo, on the sheltered west coast (see also p. 593).

CHAPTER XI

The Northern Sea Route

NORTHERN Siberia and the remote northern lands of European Russia remained for long the domain of traders, hunters, and trappers, and the place of exile for those who incurred the disfavour of the Imperial Government. The recent economic development of these remote regions has been made possible largely by the opening of the shipping route through the Arctic Ocean, and the utilization of the great rivers which flow into it.

The development of the Yakut Republic is also bound up with the establishment of road and rail transport towards the south. The difficulties which prevent ocean steamships proceeding up the Lena from the delta have already been described, and this may account for the attention which has been paid to the construction of roads and railways to link Southern Yakutia with the Amur valley and the Trans-Siberian Railway. It may prove to be more economical to exploit the natural resources of this region by joining it economically with Southern Siberia. In a similar way the future of the upper Lena near the western shores of Lake Baikal is bound up with that of the Irkutsk region. Apart from these areas, however, vast tracts of Northern Siberia now look to the Arctic Ocean as their commercial outlet.

As far back as 1527 an English merchant implored Henry VIII to finance an expedition to the Arctic, to gain access to "Tartaria, the lands of the Chinas and Cathario Orientall, to Malacca and all the Indies Orientall." In 1553 Chancellor got as far as Archangel, and journeyed thence overland to Moscow to open negotiations for trade with England. The North-east Passage remained a dream. In 1626 the Cossacks reached Krasnoyarsk, and this place, together with Yennes-eisk, became a fortified trading-post. But the exploitation of these remote lands was impossible owing to the distance which separated them from the populated regions of the west.

In the nineteenth and twentieth centuries the explorers Nordenskyold, Amundsen, and Vilkitski each succeeded in making a voyage through the Arctic. But they had to winter *en route* on the frozen sea. After the Revolution of 1917 the question of opening the Arctic for shipping was raised again. A route was established through the Kara Sea to the mouth

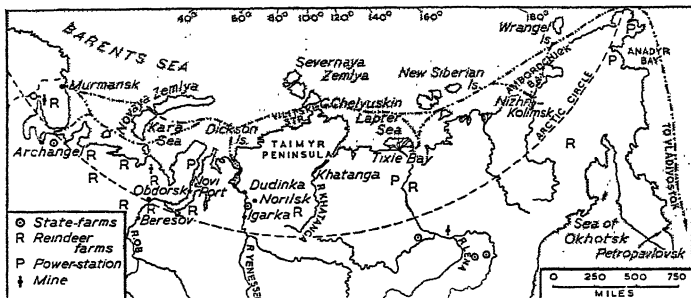


FIG. 36. THE NORTHERN SEA ROUTE

of the river Yenesei, where the port of Igarka was founded. The return journey from Murmansk and Archangel to Igarka is now made regularly each summer, while many foreign vessels, particularly British timber ships, make the voyage.

In 1932 the steamship *Sibiryakov*, under the leadership of the noted Arctic explorer Otto Schmidt, completed the entire voyage from Archangel to Vladivostok in one summer. But the cargo boat *Chelyuskin*, which reached the Behring Strait in the following year, was less fortunate. Within two-and-a-half miles of open water the ship was forced back by a terrific gale, and eventually became frozen in the ice. The hull of the vessel was cracked by ice-pressure, and 105 persons (scientists, seamen, and others) were forced to leave the sinking boat and to camp on the ice. Fortunately all but one survived and were in the end rescued by aeroplane.

In the summer of 1934 the ice-breaker *Lidka* completed the voyage from Vladivostok to Murmansk, and the next year two ordinary cargo boats sailed right through from Archangel

to Vladivostock, and two others in the opposite direction. The Northern Sea Route had been opened. In 1936 seventy-five merchant vessels entered the Arctic, and fourteen sailed through to Leningrad from Vladivostock. Since that date the Northern Sea Route has been in regular use every summer.

Along the Arctic shores radio and meteorological stations have been set up. They send out daily reports, and keep elaborate up-to-date charts of the weather and the condition and movement of the ice. Aeroplane bases have been built. From these points planes survey the ice and guide the shipping. In addition to the new ports of Novi Port, Igarka, Tixie Bay, and Providence Bay at the mouths of the Siberian rivers, a number of coaling bases have been established. A modern mechanized port and supply depot has been constructed on Dixon Island.

Some of the world's most powerful ice-breakers patrol the most difficult sections of the route, leading convoys of merchant vessels.¹

The creation of large-scale cheap transport has greatly reduced the cost of carrying heavy and bulky cargoes from the eastern parts of the Soviet Union to the west. The journey from Archangel to Vladivostock by way of the Atlantic, Indian, and Pacific Oceans is about 14,000 miles, as compared with the 6000-miles voyage through the Arctic. This new sea route has also made possible the organization of new prospecting expeditions, the beginning of coal-production in the Pechora and Tungus basins, the mining of nickel at Norilsk, salt at Cape Nordvik, and of gold in the Kolyma valley.

The story of the flight of the Russian scientists to the North Pole and the non-stop flights over the Pole from Moscow to Portland and California, U.S.A., is already well known. The increased knowledge of meteorological conditions in the Arctic regions may lead eventually to the establishment of commercial air-lines across the North Pole, making use of the shortest route between Western Europe and America.

¹ An interesting account of the opening of the Northern Sea Route, with details of the ships used in guiding convoys, is given in Chapter IX of *Soviet Asia*, by R. A. Davies and A. J. Steiger (Gollancz, 1943).

Southern Siberia

THE southern border of the coniferous forest zone lies in contact with the zone of mixed forests and wooded steppe. It was along this southern border that traders moved eastward after the sixteenth century. The early routes followed those sections of the Siberian rivers and their tributaries which flow in an east-west direction, with overland portages between them. For example, the Ket, a tributary of the Ob, was followed, and from its upper course a portage of 62 miles was made to the Yenessei. In the seventeenth century the portage and river route across Siberia was of great importance for the transport of tea from China to Nizhni-Novgorod.

The wooded steppe zone of Siberia lies between the more remote forest lands of the north and the drier steppe, for long the home of nomadic peoples, to the south. Its fertile soils offered great agricultural opportunities, and when serfdom was abolished the shortage of land in European Russia compelled the migration of peasants along this narrow fertile zone, so that between 1897 and 1917 the population of Siberia doubled.

Although Siberia occupies an area twenty-five times as great as that of France, the greater part of the surface is covered with coniferous forests, dry steppe, or mountainous land, while the large rivers flow northward into the Arctic, so that early colonization was limited to the narrow belt of wooded steppe. It was along this belt that the Trans-Siberian Railway was eventually laid down—a single track until only a few years ago.

East of the Yenessei, on the Central Siberian Plateau, and among the mountains of its southern rim, agriculture is limited to separate 'islands' of steppe, along the valleys, and on high plateaux in the mountains. These cultivated and populated areas are joined to the open lands of the West Siberian Low-

land by the railway line, which forms the core of the east-west line of movement and communications. This is cut by the great rivers, which can be utilized for north-south movement of timber and minerals, while the tributaries provide lines of lateral movement. Thus the southern borders of Siberia, possessing agricultural resources and transport facilities superior to those of Northern Siberia, have tended to become absorbed into something approaching an economic unity, closely linked with the Far East on the one hand, and the Asiatic Republics, the Urals industrial region, and European Russia on the other.

Until recent times, however, this was not so. Grain and butter were exported from Southern Siberia, and manufactured goods had to be imported. Within the last twenty years an amazing change has been brought about. The great mineral wealth has been utilized as the basis for the creation of new industrial areas, so that to-day we find some of the largest industrial enterprises of the Soviet Union located in Southern Siberia. The iron deposits of the Urals have been combined with the immense coal deposits of the Kuznetsk basin and the non-ferrous ores of Central and Eastern Siberia. Timber and wheat are sent south by rail to the Asiatic Republics. The trains return loaded with cotton for the textile mills. Together with industrial development there has been a rapid expansion of agriculture. To-day Southern Siberia is able both to meet the requirements of its own population and also to send food and manufactured goods to other parts of the U.S.S.R.

The population has increased, and the towns are no longer small provincial settlements or remote penal settlements for convicts, but busy modern centres of commerce and industry.

The recent economic development of Southern Siberia is of immense strategic significance, and is likely to be of great importance in the future trade and economic relations between the U.S.S.R. and China.

The new industrial and food-producing regions of Southern Siberia, between Lake Baikal and the Pacific, lie within reach

of the rapidly expanding industrial and agricultural areas of Western Siberia and Soviet Central Asia and Kazakhstan.

These areas all lie along the borders of Sinkiang, and the republics of Tannu-Tuva and Outer Mongolia, territories through which run overland routes to China, while the Soviet territory east of Lake Baikal stands on the apex of a triangle, the three corners of which are in the U.S.S.R., China, and Japan respectively—a 'political triangle' of major significance in the world to-day.

At the same time it must be remembered that, in spite of rapid economic development, the whole of the enormous area of Siberia east of the Yenesei contains only 6,800,000 people. The population in 1939 was distributed as follows:

Far Eastern Region (R.S.F.S.R.)	1,430,875
Yakut A.S.S.R.	400,544
Buryat Mongolian A.S.S.R.	542,170
Irkutsk, Chita, Krasnoyarsk Regions	4,386,176
	<u>6,759,765</u>

The Southern Edge of the Central Siberian Plateau

The more or less continuous belt of black earth steppe and wooden steppe plains which extend into Siberia from European Russia terminate to the west of the Yenesei, which marks the edge of the Central Siberian Plateau. This plateau is fractured into a system of horst-mountains and graben-basins along its southern edge, and is bounded by the mountains of the Sayan-Baikal system in the extreme south.

The basins and valleys are occupied by separate areas of steppe and meadowland. To the north lies the forested plateau, and the mountains and plateaux both to the north and south contain considerable mineral wealth. Thus agriculturally this part of Siberia may be considered as a broken continuation of the southern part of the West Siberian Lowland, but, unlike the latter, it possesses a combination of mineral and agricultural wealth.

Climatically, it is distinguished from the latter by a more severely continental regime. The winters are cold, clear, and

very dry, with but little snow. Typical anticyclonic weather prevails from October to March. The summers, broken by light rains at the end of July, are generally warm and dry. Dust storms are a common occurrence on the lower and flatter land. In the middle of summer the temperature may rise during the day to 85° F.

The snow and glaciers of the mountainous rim feed the rivers, which flow northward with a strong swift current engendered by the fall from the mountains to the level of the plateau. Thus the region possesses considerable potential supplies of hydro-electric energy. The Yenesei, after breaking through the rim of folded Palæozoic rocks which constitute the old mountains and plateaux of the Sayan system, in a 400-mile gorge, faced with bare, rocky cliffs and steep mountain slopes, flows through hilly country to Krasnoyarsk, where its width is about two miles. Between Krasnoyarsk and Minusinsk the river is bordered by huge alluvial terraces, the most prominent lying about 200 feet above its present level. Below Krasnoyarsk the river cuts through another rocky gorge, and forms rapids—the only obstruction to navigation between the town and the mouth of the Yenesei. This obstacle is overcome by means of tugs which assist the river steamers. Krasnoyarsk is, therefore, a river port.

The Angara river flows westward from Lake Baikal amid wild forested mountainous country. Lake Baikal, the deepest lake in the world (in the centre the depth exceeds 5000 feet), provides the river with an enormous volume of water. The depth and velocity of the stream is such that freezing of the surface occurs only from the end of December or the beginning of January until the end of March—and then only in the upper parts. At Irkutsk it is more than a quarter of a mile wide. Lower down the width increases to two miles. Possessing a swift current, a great volume of water, and an even flow throughout the year, the Angara is to become the site of a group of new powerful hydro-electric stations.

The utilization of the mineral resources of the highlands and the timber of the forests, together with the development of agricultural products in the small 'steppe' areas, has

resulted in the creation of a number of new industrial regions.

The agricultural areas lie close to the southern border of Siberia, and near to or among highland masses. The summers are warmer than in the north, and there is not the same deficiency of precipitation—a very important factor, since drought is not uncommon in Eastern and Central Siberia.

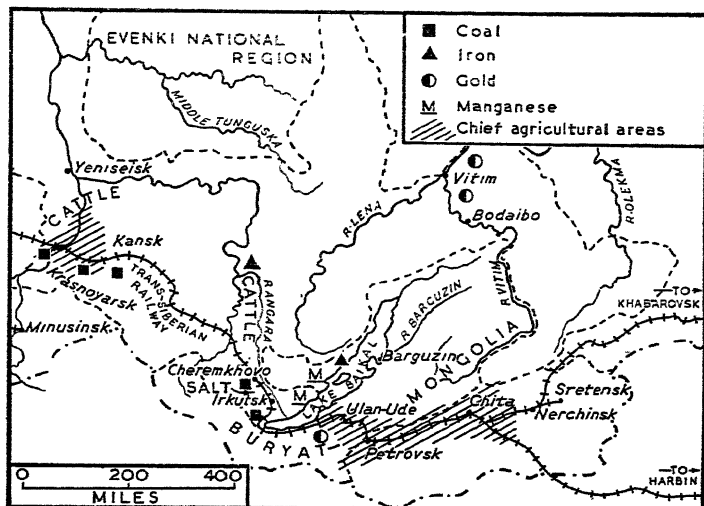


FIG. 37. SOUTH-CENTRAL SIBERIA

The mineral resources lie close to the agricultural areas, so that the new industrial regions are assured of local food supplies.

These regions are situated around the centres of Krasnoyarsk, Irkutsk, and Chita. After 1917 they were included in one administrative unit—the East Siberian Region. But the rapid economic development of the past ten years has resulted in a new administrative division, and in 1937 the region was divided into the Krasnoyarsk, Irkutsk, and Chita regions, in addition to the Buryat Mongolian Autonomous Republic.

Although the northern part of the Krasnoyarsk administrative territory (described in Chapter IX as the middle and lower Yenesei basin) constitutes the Evenki National Area, it is administered in a general way from Krasnoyarsk. The new Irkutsk region embraces the upper Lena valley and the Vitim-Olekhma Plateau, which forms a transitional region between Southern Siberia and Yakutia. Similarly the Chita region includes a large part of the plateau from which the river Aldan flows. This is a clear indication that these regions are becoming bound up economically with the development of Southern Siberia.

THE CHITA REGION

A large part of this region lies between the two rivers which together form the upper Amur (the Shelka and the Argun). These rivers flow between the roughly parallel mountain ranges which lie between the Malkahansk, Yablonoi, and Great Khingan highland systems. Along the valleys there are considerable areas of broad, open country, with fertile soils. Grain and butter production form the chief agricultural occupations. Wheat and oats together occupy about 75 per cent. of the sown area. The remainder is devoted to rye, flax, and hay. Cattle-rearing is very important, but pigs and sheep are reared also.¹

These 'islands' of agricultural production, in the Aginsk steppe, and around Petrovsk, Chita, Nerchinsk, and Sretinsk, are surrounded by thickly forested hills and mountains.

Industry. The resources of the coal-mines at Chita and Sretinsk are supplemented by coal transported by rail from the Kuznetsk basin of Western Siberia. Iron, brown coal, zinc, lead, tin, molybdenum, and other rare metals are extracted from the highlands between the Shelka and Amur rivers.

These mineral resources, together with the products of the farms—cattle and grain—and the timber from the forests, provide the basis for the iron and steel and non-ferrous metal-

¹ The collective farms are exceptionally large—up to 22,000 acres. In 1939 more than 1½ million acres of land were cultivated, served by 2616 tractors, and 1226 combine-harvesters (see *Soviet Asia*, *op. cit.*).

lurgical industries at Petrovsk and the machine-building, wood-working, leather, flour-milling, and coal-mining industries in the vicinity of Chita. Coal-mining and the refining and working of non-ferrous metals is carried on at Nerchinsk, from which non-ferrous metals are sent to the metallurgical centres of the Kuznetsk Basin. In the Sretinsk district there are coal-mines, and machine-building, leather-manufacturing, and wood-working plants.

Population. The population of the Chita region in 1939 was 1,159,478, nearly 50 per cent. of which was urban. Chita itself is a town of more than 100,000 inhabitants.

THE BURYAT MONGOLIAN A.S.S.R.

The Buryat Mongolian A.S.S.R. occupies a belt of territory which extends along the frontier between the Soviet Union and the Mongolian People's Republic to the west of the southern end of Lake Baikal. It continues northward between the eastern shores of the lake and the Yablonoi Mountains, and also along the western shores (with the exception of the area around Irkutsk) where there is a westward extension between the Upper Lena and the Upper Angara.

The forests, which provide a continuous cover over the greater part of Eastern Siberia and are everywhere the domains of Evenki (Tungus) hunters and trappers, are confined in Buryat Mongolia mainly to the northern part of the republic. In the south they are interrupted by plateaux and intermontaine steppe, the home of the Buryats and Mongols, who, in the past, were almost entirely stock-breeders and fishers. They usually lived in large *yurta*, made from grey felt. Being a nomadic people, they were compelled to live apart, with large uninhabited areas between their settlements.

Under the Soviet regime settled life is gradually taking the place of nomadism. Large numbers of Buryats and Mongols have joined collective farms and now live in neat wooden houses in the villages. Even the nomadic herdsmen are organized in 'collectives,' each of which possesses immense herds of cows, horses, sheep, goats, and even camels. The

cattle graze on the south-facing mountain slopes in summer, and in the valleys and on the lower slopes, where the snow is not too thick, in winter. Hay is collected in the autumn and sometimes is stacked in the open.

Some of the Buryats and Mongols engage in trapping. There are particularly valuable types of squirrel and sable east of Lake Baikal. A state farm has been established for the purpose of breeding and preserving the sable. Lumbering is also carried on in the forests.

Geologically Buryat Mongolia lies close to the junction between the ancient Svanid system of highlands and the Yablonoi Mountains, which form part of the fractured and dislocated southern edge of the Central Siberian Plateau.

The natural vegetation of the republic consists of a mixture of forest and prairie. The forests are rich in game, while the rivers teem with fish.

It is difficult to say whether the Buryats are an indigenous people or have come, like the Mongols, from the great plains which lie to the south. G. D. R. Phillips has presented a survey of all the known facts in his book *Dawn in Siberia* (Muller). That they came under the influence of Mongol culture and language is certain, and together with the Mongols they offered stout resistance to the Russian penetration of their lands during the seventeenth and eighteenth centuries.

By the latter half of the eighteenth century the Buryats had already lost many of their tribal pasture-lands, and were gradually squeezed out by peasant colonists from Russia. With the construction of the Trans-Siberian Railway a certain amount of industry grew up near the railway line, generally in the form of small and technically backward factories, since Tsarist policy would not allow the growth of any industrial areas which might compete with Moscow and St Petersburg.

Between the end of the nineteenth century and 1917 the Buryats lost over 3,000,000 acres of land, and the population declined rapidly. In Eastern Buryat Mongolia, where there was a large influx of lamas from Mongolia, the lama monasteries possessed vast areas of good land. Throughout Buryat Mongolia the people were illiterate.

Conditions remained more or less in this state until the new Soviet Government declared the establishment of a free union of nations in the form of a federation of Soviet national republics. After the Civil War and the wars of intervention, when the danger of foreign attack was still imminent, an independent Far Eastern Republic was set up, serving as a temporary buffer-state, and Buryat Mongolia emerged with what little industry she had possessed destroyed, and her agriculture ruined.

In 1921 two Buryat autonomous regions were formed, and in 1923 they were merged, together with the Baikal district, into a single autonomous republic, with the capital at Verkhne-Udinsk. The new republic set up its own Congress of Soviets, with delegates elected from district soviets, and the soviets of towns and villages.

With a disease-ridden, superstitious, and ignorant population and a ruined economy, they had to learn to govern themselves, and in this process they received a good deal of assistance from their Russian neighbours.

By 1928 the general economy of the republic had reached pre-war level, but in its form was little changed. Ninety per cent. of the people remained nomad or semi-nomad. But the land sown to crops increased from 453,400 acres in 1923 to 584,600 acres; the livestock increased from 1½ millions (1917) to over 3 millions in 1927.¹ The fisheries and factories revived, trade increased, literacy increased from 15·3 per cent. in 1923 to 27·5 per cent. in 1926, and the population began to increase.

During the Five Year Plans (from 1928 onward) the economy of Buryat Mongolia developed more rapidly. Large numbers of nomads adopted a settled way of life, and by growing winter fodder reduced the winter death-roll of livestock. By 1937 over 90 per cent. of all rural households were included within collective farms.

¹ Some of the herds contain 10,000 head of cattle. Altogether there are now two and a half million head of cattle in Buryat Mongolia, concentrated to the greatest extent in the south, particularly in the Selenga basin, where more than a half of the population of the republic is to be found.

Industry too expanded. A brick factory and a mechanized foundry were built at Verkhne-Udinsk, the population of which increased from 30,000 to 55,590. The nomadic Buryats began to enter the factories. During the Second Five Year Plan the Verkhne-Udinsk railway wagon, locomotive-building, and engineering works—one of the largest in the U.S.S.R.—came into operation, together with a new 39,000-kw. electric-power station. A new modern town was constructed on the hillside above the Selenga river, with well-paved streets, electric light, schools, hospitals, a theatre, etc.

Gold is mined to the east of Lake Baikal. Tungsten and molybdenum mines and refineries have come into operation at Djidinsk (west of Kyatkha) and at Mount Khaltason, where a new town of 10,000 inhabitants has grown up. Close to the new railway from Verkhne-Udinsk (now Ulan Ude) to Kyatkha coal is mined, and supplies a large chemical-metallurgical works at the former town.

The new meat-combine in the town can deal with 400 cattle, 1000 sheep, and 250 pigs per day. It is equipped with cold-storage facilities, and includes factories for the manufacture of sausages, bacon, tinned meat, and other meat products.¹ There are also important glass factories and leather works.

Close to Lake Baikal are saw-mills, tin mines, and a large fish-canning factory, the latter at the mouth of the river Barguzin. Manganese is mined on Olkhon island.

As industry has expanded trade and transport have increased. The number of ships on the Selenga river and Lake Baikal has grown steadily year by year, the total freight tonnage rising to over a million tons in 1935.

The establishment of the great meat-combine mentioned above reflects the healthy state of agriculture. By 1936 two-thirds of the arable land was served by machinery, including 1683 tractors and 280 agricultural combines.

To-day the capital of the Buryat Mongolian A.S.S.R. no longer bears the Russian name of Verkhne-Udinsk. It has been changed to the Buryat "Ulan Ude." The modern town,

¹ In 1940 the output of canned meat from this plant was 25 million tins.

with its excellent municipal services (water, electricity, buses, etc.), had a population of nearly 130,000 in 1939, as compared with 55,590 in 1932. The population of the entire republic was a little more than half a million in 1939. Illiteracy has almost disappeared, and in 1939 nearly 25 per cent. of the population was engaged in industrial occupations.

Buryat Mongolia lies between the Kuznetsk industrial region to the west, the new industrial centres of the Far East, and the gold-mining region of the Middle Lena to the north, and is an important food-producing 'base' for the urban population of these areas, besides supplying them with leather, footwear, glass, and other articles manufactured from local raw materials.

Across the north of the republic runs the northern line of the Trans-Siberian Railway (the Baikal-Amur line—probably completed, although there is no definite confirmation of this). In 1938 a new railway was built between Ulan Ude and Kyatka, on the Mongolian frontier. These railways supplement the important water routes along the Selenga, Lake Baikal, the Angara, and the Yenissei.

Strategically Buryat Mongolia occupies an important position between European Russia and Western Siberia on the one hand, and the Far East and the foreign states lying across the Far Eastern frontier, on the other. In the event of war in the Far East the agricultural and industrial resources of this small republic would be of great significance.

IRKUTSK REGION

The gold-bearing region of the upper Lena has already been described (see p. 322). The remainder of the Irkutsk region consists of forested mountains and plateaux, with agriculture confined to the wide belt of fertile soils around the Angara valley. The precipitation is relatively heavy. Summer rains and spring and autumn frosts have to be contended with. Wheat and oats may still be green at the beginning of September. Thus, although these crops are grown, cattle-rearing is of greater importance.

Industry. The upper Angara valley is particularly favoured for industrial activity. Coal is mined near Irkutsk and in the Cheremkhovo basin, production from which has increased rapidly during the last few years. Lower down the valley there are deposits of iron. Manganese and iron are also obtained from the western shores of Lake Baikal. Lime, and some of the most important salt deposits of the entire Soviet Union, are found to the north of Irkutsk. Thus there are ample natural resources for the metallurgical, glass, and chemical industries, while agricultural products and timber provide the basis for the manufacture of wood and leather. Local coal supplies and the Angara hydro-electric stations supply power to the factories, which are situated at Irkutsk and Cheremkhovo. The electric power and the bauxites of the lower Angara provide the basis of an aluminium industry with an annual output of about 40,000 tons.

At Irkutsk aeroplane engines, machine-tools, machines for mining and gold-dredging, and plywood are manufactured. The cattle farms of the valleys and plateaux supply a large meat-combine in the town. The meat products of this factory, and others at Krasnoyarsk and Ulan Ude, are sufficient to meet the requirements of the entire population of Southern Siberia.

There are a number of small industrial settlements along the Trans-Siberian Railway, but Irkutsk is by far the largest town. Its population is 243,380. It is a busy modern town, with large factories, shops, and offices—and stone roads and pavements in place of the wooden 'sidewalks' which are more usual in Siberian settlements. In addition to the modern buildings, there are the usual grey-painted wooden bungalows with fretted white window frames, and gently sloping roofs.

Irkutsk lies on the old tea-trading route from China. Its position, shown in Fig. 37, is particularly suitable for an expanding industrial settlement, since it is situated at the head of the Angara valley within easy reach of valuable mineral and power supplies. At this point the Trans-Siberian Railway passes around the southern end of Lake Baikal, and is joined at Irkutsk by a road which runs northward to the

Upper Lena valley, and the Lena navigation, which gives access to the Lena gold-fields, and the more populated part of the Yakut Republic. The Trans-Siberian Railway connects Irkutsk both with the Chita region and the important Kuznetsk industrial basin.

KRASNOYARSK REGION

Although for administrative purposes the Krasnoyarsk region extends to the shores of the Arctic Ocean, the chief centres of agriculture, industry, and population are situated in the small 'islands' of fertile soil, surrounded by mineral-bearing hills, in the neighbourhood of Krasnoyarsk and Kansk, which lie on the Trans-Siberian Railway. To the south lie the Kuznetsk basin and the Achinsk and Minussinsk steppe areas, now being developed industrially.

Lignite (brown coal) is mined near Achinsk and Kansk, and coal near Minussinsk. There are supplies of iron, copper, and manganese to the south of Krasnoyarsk.

Cattle-rearing for butter production and the cultivation of wheat are the main agricultural occupations. Near Krasnoyarsk, Minussinsk, and Kansk there are large state farms. To the west of Irkutsk agricultural conditions become more favourable, owing to the increase in snowfall which protects the ground from the severe winter frosts. The difference between the northern coniferous forest lands and the more prosperous steppe 'islands' of Southern Siberia is strongly marked in the upper Yenesei valley. Between Yeneseisk and Krasnoyarsk small clearings in the forest for cattle pasturage are supplemented by small patches of corn and potatoes. Then larger fields of corn appear, and log cabins are replaced by stone houses with thatched roofs. Finally, near Krasnoyarsk, there are large herds of cattle and numbers of pigs. Large grain-elevators near the river and railway give clear evidence of the cultivation of grain.

Not many years ago the Krasnoyarsk region could not meet the food requirements of its population. But the introduction of modern scientific methods of farming, the use of fertilizers from the new chemical works in the Kuznetsk basin, and the

introduction of frost-resistant types of grain have brought about both an increase in the sown area and an increase in the yield per acre.

Krasnoyarsk is a town of nearly 200,000 inhabitants. It is the administrative centre for a vast, thinly peopled region with a population of two millions. It was originally a fortified trading-post established after the Cossack penetration of Siberia in the seventeenth century.

Its importance has increased with the expansion of industrial and agricultural activity in the middle Yenesei basin, to the north, and in the Minussinsk and Kuznetsk areas to the south-east. Fishing, lumbering, and trapping in the northern forest zone are organized from this centre. The wharfs at the river port are busy with the trans-shipment of goods from river to rail, and vice versa. Timber from the Angara valley is sent to the Kuznetsk basin through Krasnoyarsk. Wheat is exported down the Yenesei through the port of Igarka. Valuable metals such as manganese pass through from the east on the way to the steel and metal mills of Stalinsk. The air-line to Dudinka near the mouth of the Yenesei starts from the town.

The vital rôle of air services is well illustrated by the following figures: From Krasnoyarsk to Molokov Isle, a hydroplane base about 800 miles down the Yenesei, the sledge journey in winter occupies forty days. In summer the river steamships make the journey down the river in from six to eight days. The return journey takes ten days. The regular air-service which now operates along this route is scheduled to cover the distance in eight hours.

The industries of Krasnoyarsk and Kansk are closely bound up with the utilization of local iron and coal resources, gold, timber, and agricultural products.

The warehouses of Krasnoyarsk are piled high with sacks of Siberian flour, milled in the town. Lumber from the forests supplies the saw-mills and paper mills. Other important manufactures are leather, glass, and chemicals, and there is a large plant which specializes in the construction of gold-washing machines.

Kansk is a smaller town possessing chemical, glass, and leather factories, and saw-mills.

The Southern Borders of Western Siberia

PHYSICAL FEATURES

West of Krasnoyarsk the Trans-Siberian Railway leaves the Central Siberian Plateau, enters a rolling upland country with a foundation of Palæozoic rocks, and then passes on to the West Siberian Lowland, the low, level surface of which is composed of Tertiary and post-Tertiary deposits. Along the southern boundary of the lowland the land rises gradually to over 600 feet above sea-level, to form the watershed between the Arctic and Aral Sea drainage basins.

The West Siberian Lowland is divided into two administrative units—the Omsk Region and the Novosibirsk Region. The southern portion of these regions may be divided as follows:

The Borders of the Coniferous Forest Zone

This section of the lowland is particularly level and flat.

The Central Plains, between the Irtysh and the Ob

The surface of these plains is level or rolling, as the country occupies an old sea- and lake-bed. Between the two rivers, and mainly to the south of a line joining Omsk with Novosibirsk, the land is studded with numbers of lakes, some of considerable size. But in spite of the generally level nature of the land there are local variations. For example, there are low hills between the rivers, particularly in the south. Although they seldom rise above a height of 130 feet, it is said that the native people call them mountains, a reflection of the nature of the surrounding landscape. Towards the south there are also lines of very low parallel ridges, swelling upward to a height of from 15 to 20 feet, and extending in a general south-west-north-east direction.

The River Valleys

The valleys provide a welcome break in the more monotonous plain areas. The right banks are high, often rising to steep bluffs, covered with cool pine-woods, and frequently overlooking broad meadowlands studded with woods. The valleys are usually broad and the left banks are low.

It was the level nature of the land which assisted the early exploration and colonization of Siberia at a time when the only means of travel were the sledge in winter and the rivers in summer. The Cossacks traversed Siberia from west to east during the sixteenth century and early in the seventeenth century. The early penetration took place along the northern edge of the steppe, where the wooded country afforded protection from the nomadic tribesmen. The lateral tributaries of the great rivers assisted the traders who followed the Cossack bands. For example, the river Ket, a tributary of the Ob, flows close to the Yenesei. Another tributary farther south was also used, and from the upper reaches of these rivers portages were made. There have been many projects for linking the Yenesei to the Ob by means of a canal.

The river and portage route was followed in the seventeenth century by the tea-traders who transported tea from China to Nizhni-Novgorod. Forts were set up at river junctions and at the head of navigation. Later more southerly routes were followed, and Krasnoyarsk, for example, became more important than the old trading-post of Yeneseisk. The possibility of reopening the northern route as a supplementary line of communication and to assist the development of the southern border of the coniferous forest zone has recently been revived, and the construction of a railway from Yeneseisk to Tomsk, and a canal to link the Ob with the Volga (Fig. 38) has been considered.

The South-east Corner of the Novosibirsk Region

In the south-eastern corner of the West Siberian Lowland the land rises gradually to the foothills of the Altai-Sayan

mountain system. The broad valleys are surrounded by hills, and as the land becomes definitely mountainous, there are broad level plains between the heights, similar to the isolated

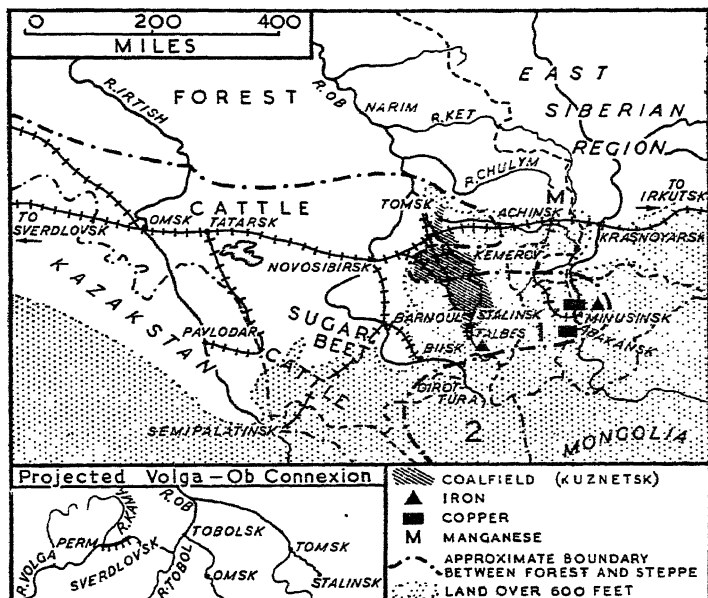


FIG. 38. SOUTH-WESTERN SIBERIA

steppe 'islands' of Central and Eastern Siberia, each with its own special name—e.g., the Abakansk and Minussinsk steppes.

The Altai Mountains

Farther south, the steep slopes and sharp granitic sierras of the Altai rise above the foothills. Although the Altai consists of a square highland block rather than a number of well-defined ranges, the ridges of both the Altai and the Sayan show a general east-west trend, fanning out at the north-west

corner of the Altai block into the Kuznetsk and Salair Alai Tau Ranges, which rise to a height of between fifteen and sixteen thousand feet. These mountains enclose the Palæozoic deposits of the Kuznetsk coal basin, a region of rolling upland country.

The highest ridges have been given the name of "Belki," a name similar to the European term "Alps." It indicates the white, snow-covered nature of the peaks. The snowline occurs at a height of about 8000 feet in the south-east, and many of the higher ridges rise 1000 feet above the snowline on the south-facing slopes and 2000 feet on the north-facing slopes.

The hard, ancient rocks of these mountains are flanked by sedimentary strata, and at the junction there occurs a great wealth of mineral deposits, including iron, gold, copper, silver, zinc, and rare metals, in addition to the coal of the Kuznetsk basin, the reserves of which are estimated to be six times as great as those of the Don basin in European Russia. The rivers which flow from the mountains also possess great reserves of hydro-electric power.

The Katun river, the main tributary of the upper Ob, obtains a large proportion of its water from the melting snow and glaciers of the snow-capped giant Mount Byelukha (14,900 feet). Like all the mountain rivers, the Katun has a swift current and a great volume of water, passing through steep-sided rocky valleys and ravines.

At Barnaul the Ob is a quarter of a mile in width. Between Novosibirsk and Narim it broadens out to half a mile, and eventually to more than three miles at its junction with the Irtysh, where the Ob has a great depth. The head of navigation is at Kuznetsk, which may be reached by large river vessels in May and June. After June, however, the channel becomes shallow and obstructed by shoals and sand-banks, so that only smaller craft can make the journey.

The Katun is navigable as far south as Biisk. The Ob-Irtysh system has a total length of 3000 miles. The value of such navigable waterways in a region which originally possessed few roads, and where long distances have to be traversed,

is obvious. Modern communications are further assisted by the absence of any obstacles to transport by road or rail throughout the level or rolling plains.

Thus the physical structure of this part of the West Siberian Lowland has given it a large area of land suitable for large-scale agriculture, and the employment of modern machinery, together with excellent facilities for north-south and lateral communications. The valley lands and intermontaine 'steppes' also possess considerable agricultural possibilities, while at the junction of highland and lowland in the south-east there are great resources of minerals and water-power.

CLIMATE, VEGETATION, AND AGRICULTURE

The climate of this region has been described as consisting of five to six months of bitter cold, three months of spring and autumn slush and mud, and three or four months of glorious summer, with some rain at the end of July and the beginning of August.

The winter snowfall is light, and the biting winds which sweep across the plains pile it high into deep drifts. It is the extreme cold of winter combined with the lack of moisture that is responsible for the absence of such trees as the oak and the elm in the wooded steppe. The extreme continentality of the climate is illustrated by the fact that the July isotherm of 68° F. and the January isotherm of - 4° F. pass through the centre of the region. The colder north is divided from the warmer south by the annual isotherm of 32° F. The southern summer is a month longer than that of the north.

The lack of moisture is reflected in the almost sudden change from the coniferous forests of the north to the steppe of the warmer south. The penetration of milder, damper air which has resulted in the development of the intermediate deciduous forest zone in European Russia is altogether absent, the latter being replaced by open woodland or wooded steppe, in which the birch is the common tree. Birch, pine, and fir-trees often border the fields. Birch-woods frequently

clothe the sides of the valleys, while on the bluffs overlooking the valleys there are sometimes pine-woods. The alluvial valley bottoms support rich meadows.

Towards the south the trees gradually disappear, until finally there is only the open landscape of the treeless steppe.

The Northern Lumber and Cattle Zone

The southern borders of the coniferous forests provide the basis for the lumber industry. Timber is sent to the south, to the treeless steppe of Kazakhstan, and even to the Asiatic republics. The main saw-mills are situated at Omsk and Novosibirsk. The damp meadowlands of the river valleys and the open woodlands in the transitional zone between forests and steppe support herds of cattle, and some flax is grown.

The Central Zone

Although the northern limit of sown crops is gradually being extended farther to the north, the black earth lands of the steppe and wooded steppe are the most important areas for agricultural production. The Barabinsk steppe of the north is a lightly wooded area with a very level surface. Great grass-covered tracts extend, unbroken by any features of relief, for distances varying from five to fifteen miles. Trees are concentrated in small woods surrounded by steppe, so that it is often difficult to say whether woods or grassland occupy the greater area. In the south there is the drier and less wooded Kuludinsk steppe.

This central zone is occupied by state farms of great size. Near Omsk, in the wooded steppe, for example, there is a state cattle farm which occupies some 12,000 acres. It has a herd of 2000 dairy cows and employs about 500 workers. The countryside is dotted with birch-woods. Houses and sheds are of wooden construction. About one-half of the land is devoted to pasture and woodland. The remainder is arable land, used for the production of ensilage. The crops are cut while they are still green in July, and stored in deep

pits, covered over with earth, where they ferment and produce excellent winter fodder. Grain is also cultivated and kept in large stores. During the severe winters the cattle have to be kept indoors.

Tractors, combine-harvesters, motor lorries, and motor-cars are used on the farm, which possesses a modern workshop and forge, an experimental field attached to an agricultural laboratory, and a veterinary hospital. The wooden houses in the village are neat thatched buildings, each with a shed at the back for the farm animals which are the personal property of the farm-workers, and a large kitchen garden. The houses are heated by wood stoves, the firewood being brought from local saw-mills and stacked in the yards during the autumn.

Apple orchards are now common in the farms of the central zone, largely as a result of the experimental work initiated by the Soviet scientist Michurin. Bushes are planted as wind-breaks, and the trees—specially selected stock and able to withstand the severe steppe climate—are trained to bend and trail over the ground, to avoid the cold, biting winds of winter. Omsk is now the centre for Siberian orchard produce, and new orchards have been established as far north as Tobolsk.

Farther south there are large grain farms. Pig-rearing is an important occupation, and sugar-beet is grown, especially in the Barnaul district. The drier steppes near the borders of Kazakhstan are devoted to cattle- and sheep-rearing for meat production. The precipitation falls to 8 or 10 inches and becomes increasingly unreliable. Large tracts of land have, however, been brought under the plough by the extension of dry-farming, with deep tractor-ploughing and the use of drought-resistant varieties of plants.

The land around Barnaul, for instance, is one vast corn-field broken only by an odd patch of pinewood or an occasional field of sunflower. Machinery and tractors are to be seen everywhere. Around the houses of the farmers, tomatoes and melons are grown in kitchen gardens, and near the towns there is a good deal of market-gardening for the urban market.

It is this central zone which supplies the raw materials for the flour-milling and leather-working industries of Omsk and Barnaul. The latter town is also the main centre of the sugar industry. The manufacture of butter is an important occupation in the northern and central parts of Western Siberia.

The Southern Alpine Zone

The Altai-Sayan mountain system acts as a gigantic condenser of the moisture in the winds which blow from the unbroken steppe plains to the north and north-west. Thus, the precipitation increases rapidly towards the south-east.

The slopes of the hills and mountains are forested with birch, fir, cedar, and pine, and on the lower slopes there are open, park-like larch-woods. The valleys contain lush meadows while on the plateaux are 'steppes,' often completely surrounded by the forested heights.

In spite of the short summers the valleys support a luxuriant plant growth. There are wild strawberries and rhubarb in the Katun valley, wild peony, rhododendron, delphinium, and blue gentian on the slopes of the Altai, and many beautiful Alpine plants and flowers on the higher slopes, with wild roses and honeysuckle growing in the shade of the trees.

About 42 per cent. of the Altai region consists of high barren mountain country, and some 31 per cent. is forested. It is possible to cultivate about 27 per cent. of the total area. The short, damp summers make the cultivation of grain rather difficult. It is grown in some areas—wheat, rye, and buckwheat, mainly to meet local requirements. On the higher valley sides wheat may still be green in mid-August, and it is liable to be killed by sharp frosts at this time.

The peasants have for long devoted their attention to the production of hay and flax, and the rearing of dairy cattle on the meadows. The larger villages have co-operative creameries. Butter is taken in carts to the rivers for transport to the more populated districts to the north, or to the Trans-Siberian Railway for export to other parts of the Soviet Union.

In many of the settlements of the Altai butter is an important source of income for the peasants. One very interesting feature of this part of Siberia is that cows, horses, and even pigs develop thick winter coats which enable them to withstand the severe cold.

In the middle and lower parts of the valleys the people live in small villages near the rivers. Some villages, surrounded by pasture and woodland, are enclosed by a high fence.

Higher up the valleys there are scattered farmhouses, plastered and whitewashed like the peasant cabins of Ireland. The villages are small and frequently consist of a little group of dwellings on a strip of flat grassy land between precipitous rocky and forested mountain slopes and the river cliffs.

The Southern Alpine zone, together with part of the foothills of the Altai and Sayan Mountains, is divided into the Khakass and Oirot Autonomous Provinces, formerly backward and primitive regions. (These provinces are marked by the figures 1 and 2 respectively, on Fig. 38.)

The Khakass Autonomous Province is bounded on the east by the upper Yenesei, a tributary of which, the Abakan, flows through the centre of the province, from south-west to north-east.

In the south and north-west the mountain slopes are covered by thick coniferous forests, mainly composed of cedar, larch, and fir. Altogether, about 60 per cent. of the territory of the Khakass Province is forested. Hunting, trapping, and lumbering are important occupations. Fur farms, where valuable fur-bearing animals are bred, have been established. Resin is obtained from the forest trees, and the lumber industry has expanded rapidly. Some of the timber is used for building construction within the province. The remainder is sent to other parts of the Soviet Union. The river Abakan is used for floating timber down to the saw-mills at the town of Abakan, the capital of the Khakass Autonomous Province.

The high Alpine pastures and valleys support flocks of sheep, while the rich grazing lands in the valleys between

the foothills of the Altai and Sayan Mountains, in the north-east, are devoted to cattle-rearing.

In these valleys, and also in newly cleared forest-land, the collective farms raise crops of oats, barley, and wheat. Several thousand acres of these crops are now cultivated (see p. 222). Most farms grow vegetables and possess orchards.

The Abakan steppe has for long been noted for the horses and cattle which are bred there. The higher and arid grassy plateaux were inhabited by nomadic Khakass tribes who lived in *yurta*, and kept herds of sheep, horses, cattle, and even deer. To-day much of this semi-arid steppe is under cultivation. Some 74,000 acres of land have been irrigated. The *yurta* and primitive villages are being replaced by the neat wooden houses and buildings of the collective farms.

Similar changes have taken place in the Oirot Autonomous Province, which consists almost entirely of mountains, forests, and valley pastures. In 1926 there were only forty-four head of cattle. By 1932 there were over 17,000. Although no precise figures are available for 1940, it is known that there were between 50,000 and 100,000 head of cattle.

Milk cattle are the basis of the butter industry, which has grown in proportion to the growth of the size of the herds.

The Oirot Autonomous Province could not possibly expand its economy, however, without the construction of a system of good communications. Formerly many of the valleys were remote and isolated, without any sort of roads. In some villages a wheeled vehicle had never been seen. The horse was the only means of transport. This is no longer so. Within the past ten years, in addition to the improvement of the old roads along the Katun and Chulishman valleys, nearly 1500 miles of new roads have been constructed.

The wild, rugged, forested country of the Altai, with its beautiful lakes, steep gorges, rushing torrents, and the rugged peaks of the snow-clad Alps, has often been called the Soviet Switzerland. But, although on a small-scale map it appears to be insignificant in size, its area is, in fact, ten times greater than that of Switzerland. It has great possibilities for development as a tourist centre.

ECONOMIC DEVELOPMENT

Economically the Novosibirsk region occupies the most important position in Western Siberia. It stands at the crossroads between the forests of the north, the open grainlands of the centre, the meadows of the river valleys and the Altai, the cattle lands of the dry steppe of the south, and the irrigated cotton- and fruit-producing regions of the Asiatic republics. In the south-east, at the junction between lowland and mountains, there are rich mineral resources and reserves of water-power. To the east lies the timber and mineral wealth of Central and Eastern Siberia; to the west, the great industrial resources of the Urals.

There are excellent facilities for communications in both lateral and longitudinal directions, so that the region is well situated for the bringing together and exchange of the products of farm and mine, and, unlike Eastern and Central Siberia, life is not restricted to valleys and isolated steppe 'islands.'

In Tsarist times industry was very slightly developed. The region was of importance mainly for its export of wheat and butter, products which could be transported for fairly long distances. Manufactured commodities had to be imported from abroad or from other parts of Russia.

During ancient times the region around the Altai was the point from which there took place a great dispersal of Mongol and Tartar peoples. To-day it has become the focal point for the industrial and agricultural development of a great part of Siberia and Asiatic Russia. With the increase in the sown area and the number of cattle and pigs, and the consequent expansion of the meat processing and packing industry, Novosibirsk is becoming the Chicago of the U.S.S.R. Mechanization of farming has done much to overcome the shortage of labour. It must be remembered, however, that the population of the U.S.S.R. is growing rapidly, and this region is able to absorb a large number of immigrants.

A great impetus to industrial development has been given by the construction of the Turksib Railway, along which

wheat and timber are sent south to the Asiatic republics, which are thus able to concentrate their attention upon the production of cotton and silk. The latter materials supply the textile factories of Barnaul and Novosibirsk.

INDUSTRIAL EXPANSION

The most striking industrial expansion has been based upon the utilization of the excellent coking coal of the Kuznetsk basin in combination with the iron resources of the Urals, thus forming the famous "Ural-Kuznetsk Combine," the second great coal and metallurgical region of the U.S.S.R.

Coal is sent westward by rail 1250 miles to the Urals, and the trains return loaded with iron ore. Thus each region supplies the other with that mineral in which it is deficient, making possible the growth of two centres of heavy industry. The Kuznetsk basin lies to the south-east of Novosibirsk, and is served by two branch lines of the Trans-Siberian Railway. The coal from this basin is of particularly high quality, and lies in thick seams close to the surface, thus reducing the cost of working. The calorific content of the coal is much higher than that of the Don basin, while it contains a much smaller proportion of sulphur. Some of the coking coals give a large quantity of waste volatile substances used in the chemical industry (*e.g.*, at Kemerovo).

The mines are highly mechanized, and a great deal of electrical power is used. By 1938 the annual output of the basin had risen to 17.3 million tons, and by 1940 to 25 million tons—nearly one-quarter of the output of the Don basin, and nearly 15 per cent. of the total output of the U.S.S.R.¹

When the Ural-Kuznetsk Combine was planned it was thought that there were no large resources of iron near Novosibirsk. Consequently the steel industry at Stalinsk has

¹ Although similar in area to the Donetz Coalfield, the reserves amount to 450 milliard tons—30 per cent. of the entire coal reserves of the U.S.S.R.—as compared with 90 milliard tons in the Donetz. The average thickness of the Kuznetsk seams is from 20 to 23 feet. Some attain a thickness of 40 to 60 feet. The Donetz seams are usually about $1\frac{1}{2}$ feet thick.

been built up on ore from the mines in the Magnitogorsk district in the Urals. The annual output of steel from the Stalinsk mills is now over 2 million tons. But iron deposits, mainly magnetite iron, have been discovered in the hilly, wooded country south-east of Stalinsk, where there is now a large mining settlement. The output of ore from these mines is 1 million tons per year. It contains a considerable admixture of iron pyrites and zinc blende, used in the chemical industry. Other Siberian iron deposits which are now being worked are situated at Minussinsk and in the Angar-Ilim and Trans-Baikal regions. The Baikal and Kemerovo mines produce ore with a high content of iron in a very pure state.

The new iron and steel plant at Talbes, south of Stalinsk, uses only local supplies. There are also important metallurgical works at Novosibirsk and Minussinsk.

But the industrial activity of the region is not limited to mining, or to iron and steel manufacture. The chemical industry has been developed on the basis of waste products from the process of coke manufacture and from the metallurgical industries. Iron pyrites from the local ore is used in the manufacture of sulphuric acid, for example. Salt is obtained from the Urals, the lake-beds of Kazakhstan, and the Irkutsk region, and glauber salts from the lakes of the Kulundin steppe in the south-west of Western Siberia. Agriculture is supplied with fertilizers from the chemical factories of Kemerovo and Stalinsk. There are textile mills at Barnaul.

The development of agriculture, mining, and transport, not only in the Novosibirsk region but throughout Southern Siberia and the Asiatic republics, has created a demand for machinery of all kinds. Mining equipment, machine-tools, locomotives, railway wagons, agricultural and textile machinery, are constructed in and around Novosibirsk and Leninsk-Kuznetsk, Barnaul, Omsk, and Tomsk.

This industry needs not only iron and steel, however, but considerable amounts of non-ferrous metals. This has created another important sector of industry—non-ferrous metallurgy.

The old rocks around the rim of the coal basin, especially in the Salair and Kuznetsk Alai Tau Ranges, are rich in non-ferrous deposits. Copper is mined near Minussinsk and supplies are also brought from the Kounrad mines of Kazakhstan. Zinc is obtained from Kazakhstan, from Nerchinsk in Eastern Siberia, as well as from the local mines in the Salair Mountains. Wolfram and molybdenum are among the metals supplied by the mines of Kazakhstan and the Trans-Baikal region. A few miles from Achinsk manganese, an essential mineral for the manufacture of high-grade steel, is produced. The reserves are estimated to be about 4 million tons.

The electrification of industry has proceeded rapidly. At Kuznetsk and Kemerovo there are large power stations which use coal, while hydro-electric stations have been constructed near Biisk, on the river Berbi, and at other points in the Altai region. For the proposed electrification of the Trans-Siberian Railway between Novosibirsk and Magnitogorsk, power stations, operating on Kuznetsk coal, are being constructed where the line crosses the rivers, the only source of water supply in the steppe.

The importance of transport in the bringing together of raw materials is obvious. In addition to the Turkestan-Siberian Railway (Turksib), many new lines have been laid down in the Novosibirsk region (Fig. 38). The use of canals for the transport of such heavy commodities as coal, iron ore, and fertilizers has been considered, and the completion of the project for the Ob-Volga Canal would be of the greatest value.

Industry has not been confined to the areas described above. The Khakass Autonomous Province, once a remote part of the Altai, is now an important producer of gold and coal, in addition to timber. The gold-mining settlements are in the north-west, around the spurs of the Kuznetsk Alai Tau. There is a great variety of minerals in this area, copper being especially common.

Coal is mined at Chernogorsk, about twelve miles north-west of Abakan. It is now the chief coal base for the Krasnoyarsk region. Linen is manufactured at Biisk.

POPULATION AND SETTLEMENTS

The Plateaux and Valleys of the Altai

The Khakass Autonomous Province is peopled by some 270,000 inhabitants; about 50 per cent. are of Turkic stock. The Oirot Autonomous Province has a population of 161,431. About 45 per cent. of the people of the latter region are Russian immigrants. The remainder are mainly Oirots and Tartars, of Turkic origin, together with some Kalmuck groups of Mongol descent.

The settlements of the Oirot region consist of small wooden houses, constructed by the peasants. In the past many of the people lived in crude wooden *yurta*. Home handicrafts, such as the spinning and weaving of linen and wool and the making of ropes and boots, are still carried on.

The Kalmuck settlements of the high wooded mountain valleys in the past consisted entirely of groups of conical *yurta* and log huts surrounded by a high fence. But here also more modern ways of life are fast replacing the old.

The Kalmucks speak a Turkic dialect. But they came originally from North-east Mongolia, and were named Kalmucks by the Russians, who had met a similar group of people, a Mongolian tribe which had settled on the banks of the Volga during the seventeenth century.

In the high plateaux the nomadic tribes have for long been engaged in the trading of antlers and horns of the moose with Mongolian merchants from whom they buy tea. Such trade is now carried on through the medium of Government stores. Ust-Koksu is a typical trading centre in a district of some 100,000 inhabitants, mainly Kalmucks. It is a village situated in a valley at a height of 3000 feet above sea-level. There is a co-operative store where the native people sell furs and skins (marmot, bear, and wolf) and antlers and horns.

Oirot Tau, previously known as Ulala, is the administrative centre of the Oirot Autonomous Province, the population of which is mainly rural. There are few settlements of any significant size apart from Oirot Tau, which is a relatively

large town, with broad walks and streets, and is supplied with electricity from a hydro-electric station in the mountains.

The population of the Khakass Province is greater (270,655). More than 40 per cent. of its inhabitants are engaged in industrial occupations, living in mining settlements such as those near Abakansk and Minussinsk. They are connected with the large industrial regions by the railway line from the latter town to Achinsk, on the Trans-Siberian Railway. The expansion of Khakass economy is reflected in the increase in population, and the development of social services. In this formerly illiterate region there are now 340 schools.

In the foothills and more level land near the Altai the Siberian farmers rarely live in scattered settlements. The shortage of water in all the steppe areas compels them to congregate in villages near the water-courses. The houses are kept warm and airtight in winter by means of moss or hemp packing between the partly shaped logs with which they are built. Near each house there are sheds and cattle-shelters, all enclosed by a high fence, while the kitchen garden is surrounded by a wattle fence which an American traveller has described as being "cow-tight, hog-tight, and chicken-tight."

Industrial Towns

Kuznetsk, recently renamed Stalinsk, lies among meadows and marshes in the broad valley formed by the junction of the Tom and Kondoma rivers. It is the chief centre of the Siberian steel industry. In 1939 its population was 169,538. To the north are the towns of Belovo and Leninsk, the latter having 81,980 inhabitants. Still farther north, on the northern edge of the coal basin, is Kemerovo (132,978), the centre for coal-mining, coke-manufacturing, and the zinc, lead, and chemical industries. The largest industrial town is Novosibirsk. Its population now exceeds 400,000. It is a modern city, with large new stone and ferro-concrete buildings of the skyscraper type, broad streets, and well-planned parks and gardens. The Novosibirsk College of Agricultural Science is the central research and training institute for the whole of

Western Siberia. Around the town are large machine-building and other factories and grain elevators, and railway marshalling yards at the junction, from which railway lines radiate to the east and west (the Trans-Siberian), southward to Turkmenistan, and south-east to the mining and industrial regions of the Altai region.

To the south of Novosibirsk, Barnaul (148,129) is situated at the junction between the Turksib Railway and the branch line to Biisk, a town of 80,000 inhabitants. Both these towns stand in the steppe zone, in the midst of rich wheat-producing areas, relatively thickly populated by Russian immigrants, who have come to the region since the time of the abolition of serfdom. Barnaul is the centre of a sugar-beet region, and possesses sugar factories, flour-mills, and leather, refrigeration, and textile plants.

The drier areas—the Abakhansk steppe and the southern borders of the Novosibirsk region, with no fresh running water throughout large districts, and with no winter crops owing to the deficiency of snow—are very sparsely peopled.

Omsk and Tomsk are the two chief towns, apart from Novosibirsk, along the northern border of the steppe zone. Tomsk (141,215), an old university town, lost some of its importance as a centre situated on the old trade route from the east when the railway line was constructed to the south, taking traffic through Omsk and Krasnoyarsk instead of through Tomsk and Yeneseisk. A project has been considered for a new line between the two latter towns, and plans have been made to construct another railway from Tomsk to Tobolsk. Flour-mills and aeroplane-engine building, metal-lurgical, and leather-working factories are situated in the town.

Omsk is a factory town with a population of about a quarter of a million, situated at the point where the Trans-Siberian Railway crosses the Irtysh. Its industries are similar to those of Tomsk.

The Novosibirsk and Omsk administrative regions are densely peopled, according to Siberian standards. They have populations of 4,500,000 and 2,500,000 respectively. They

include large, lightly populated regions in the coniferous forest zone. Rather less than half of the population is concentrated in the towns and villages of the steppe lands, and rather more than half is employed in rural farming areas.

The economic importance of Western Siberia is illustrated by the fact that, although it occupies only one-twelfth of the land surface of Siberia, it includes about 50 per cent. of the entire population.

BIBLIOGRAPHY

GENERAL

Russian

- B. BAYEVSKY: *Economic Geography of Siberia* (Moscow). "Mineral Wealth of Siberia," in *Priroda* (1922), Nos. 3, 4, 5, pp. 73-94.

English

- B. BAYEVSKY: "Siberia, Storehouse of the Future," in *Economic Geography*, vol. iii (1927), pp. 167-192.
H. C. WILSON and E. R. MITCHELL: *Vagabonding at Fifty* (West and Central Siberia) (Hutchinson, 1929).

WESTERN SIBERIA

Russian

Articles published in "Nasha Strana" (Moscow)

- F. LYAKHOVSKI and KOZHEVNIKOV: "Kuzbass," in No. 11, 1940.
N. YNITSKI: "The Kuznetsk Basin," in No. 11, 1940.
"In the Khakass Steppe," in No. 3, 1941.

English

- H. C. WILSON and E. R. MITCHELL: *Vagabonding at Fifty* (Hutchinson, 1929).

See also bibliographies at pp. 66, 253.

CENTRAL AND EASTERN SIBERIA AND THE FAR EAST

Russian

Articles published in "Nasha Strana" (Moscow)

- B. LUNIN: "On the Vilui," in No. 6, 1940.
V. SEDOV and P. SHUVETSOV: "Across the Pole of Cold in the Region of Gigantic Icefields" (Yakutia), in Nos. 3, 4, 5, 1940.
V. PRZHEVALSKY: *Journey through the Ussuri Region, 1867-69* (Moscow, 1937. Detailed observations of climate and vegetation).

English

- V. K. ARSENIYEV: *Dersu the Trapper* (Ussuri Basin) (Secker, 1939).
M. BURR: *In Bolshevik Siberia* (Lena-Aldan district) (Witherby, 1931).
S. NOVAKOVSKY: "Climatic Provinces of the Russian Far East," in *Geographical Review*, vol. xii (1922), pp. 100-115.
G. D. R. PHILLIPS: *Dawn in Siberia* (Buryat Mongolia) (Muller, 1943).
Russia, Japan, and Mongolia (Muller, 1942).
V. ZENZHOV and ISAAC VON LEVINE: *The Road to Oblivion* (Kolyma region) (Cape, 1932).

THE NORTHERN SEA ROUTE AND THE ARCTIC

Russian

Articles published in "Nasha Strana" (Moscow)

- M. RAIKHENBURG: "The Northern Sea Route," in Nos. 9, 10, 11, 1939. Several articles dealing with the Arctic and Arctic exploration in No. 1, 1940.

English

- L. BRONTMAN: *On Top of the World* (Gollancz, 1938).
R. GRUBER: *I Went to the Soviet Arctic* (Gollancz, 1939).
S. MOGHIELEVSKA: *The Camp on the Ice-field* (Routledge, 1940).
H. P. SMOLKA: *Forty Thousand against the Arctic* (Hutchinson, 1937).
PROFESSOR K. MASON: "Notes on the Northern Sea Route," in *Geographical Journal*, July 1940.

CHAPTER XIII

Soviet Asia

KAZAKHSTAN

KAZAKHSTAN, one of the largest republics of the U.S.S.R., consists of an extensive lowland of Tertiary and Quaternary horizontal sedimentary deposits, bordered in the east and south-east by mountains of the Hercynian folded system. In the north-east there is a continuation of the Hercynian system extending westward towards the Urals to form the Kazakh upland country.

Physical Divisions

THE PRE-CASPIAN AND NORTH TURAN LOWLAND

This lowland, the altitude of which rarely exceeds 300 feet, occupies a large part of Western Kazakhstan, and represents an extension of the sea into a region of subsidence in relatively recent geological times. It is divided by the Mugodzhzar Mountains, the low southern extension of the Urals. To the south of these mountains lies the Ust-Urt Plateau, a barren, waterless region which rises in steep, often cliff-like escarpments to a height of from 200 to 300 feet. The surface consists of monotonous clay semi-desert, completely lifeless, the landscape unbroken by the green of grass or bushes. Not even the cry of a bird is to be heard in this desolate region.

East of the Mugodzhzar the Tertiary deposits of the Turan Lowland are continued northward as a narrow zone between the mountains and the Kazakh Upland region. This zone is the Turgai tableland region, comprising a number of not very high flat-topped steep-edged heights, situated like island blocks amid the surrounding plain. A large portion of both the pre-Caspian and Turan Lowland has a barren clay surface, often covered with sands. Around the Aral Sea the sand deserts are particularly well developed, and are known as the Barsuk, Kara Kum, and Kizil Kum.

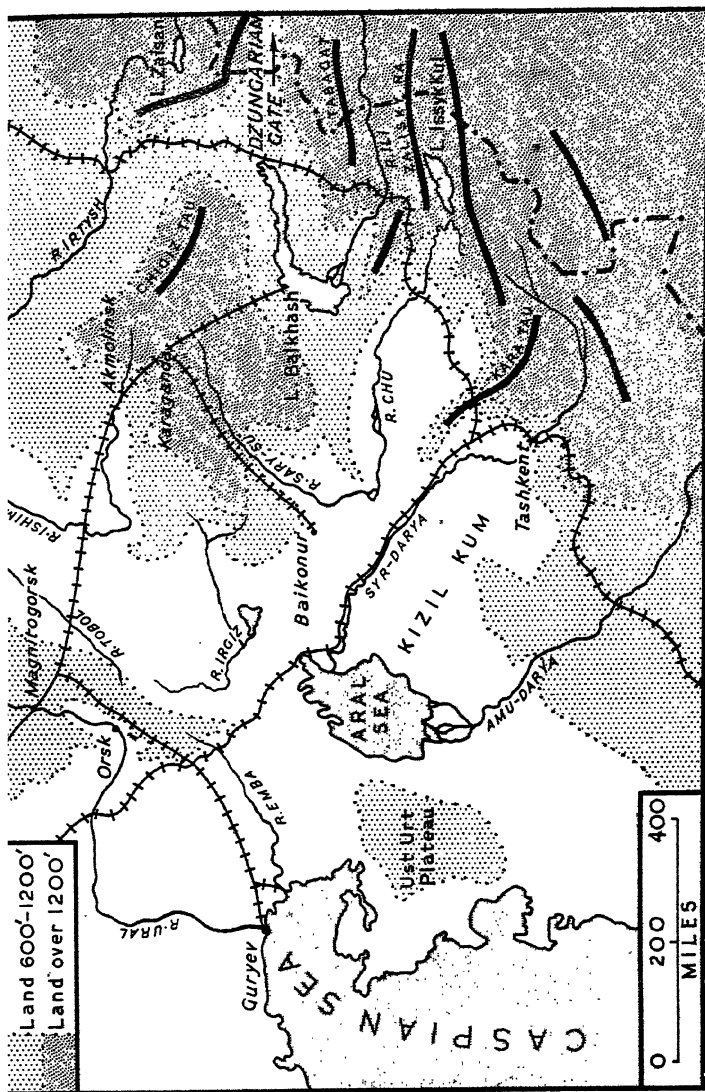


FIG. 39. KAZAKHSTAN: RELIEF AND COMMUNICATIONS

The only rivers of any significant size are the Ural and the Emba. The streams throughout the remainder of the lowland drain into inland saline lakes, or lose themselves in sands and salt marshes. Between the Aral and Caspian seas there are no streams at all.

THE HIGHER EAST

To the east of the Turgai tableland region rises the Kazakh Upland country, a region of Hercynian folding, considerably eroded and worn down, but with a range of short broken heights running from south-east to north-west, with an average altitude less than 5000 feet above sea-level. But it must be noted that these heights rise from an upland plateau which is itself from 1000 to 3000 feet above sea-level. In the east these highlands join the Tarbagat and Altai Ranges.

The Tobol and Irtysh rise on the northern slopes of the highlands which separate the Arctic from the Aral Sea drainage. The inland drainage basin around the Aral Sea contains numerous salt lakes, usually shallow, but in some cases of considerable extent.

The southern part of the upland consists of the arid Bet-Pak-Dala Plateau. The plateau falls from a height of about 1600 feet in the north to less than 500 feet in the south. The northern edge is a steep escarpment, similar to that of the Ust-Urt Plateau.

Outcrops of crystalline and magmatic rocks occur in many places. In the north there are numerous solonchak¹ formations, while towards the south there are great expanses of desert and semi-desert. Although the Syr Darya runs along the southern edge of the plateau none of the streams which flow from the higher land manage to reach this river. Their dried-up channels, however, indicate that at one time they were, in fact, tributaries of the Syr Darya. To-day they become lost in the sands.

The landscape of the Bet-Pak-Dala tableland is as lifeless as that of the Ust-Urt region. But the surface is different, since it is not even, but broken by ravines and low hills.

¹ See p. 115.

Large areas consist of barren rock, or sand deserts, with salt lakes in shallow depressions. In some parts there is a covering of small bushes and saksaul. The inhospitable nature of this part of Kazakhstan has led it to be aptly named by the native people the "hungry" or "accursed" steppe.

THE ALTAI AND NORTHERN TIAN SHAN MOUNTAINS

This region embraces the Hercynian folded mountain system which borders Kazakhstan on the east. It includes the valley of the upper Irtysh, the depression around Lake Zaisan, and the Bukhtar valley. It stands in contrast to the rest of the Kazakhstan by virtue of its warmer climate and the areas of steppe in the wide Irtysh valley, which lies like an oasis, full of life and colour, with fields of tobacco, melons, and other crops. The mountains contain rich deposits of silver, gold, zinc, lead, and copper, as well as such rare metals as wolfram.

SOUTH-EASTERN KAZAKHSTAN

South-eastern Kazakhstan consists of a lowland composed of Quaternary deposits at the southern end of the Bet-Pak-Dala Plateau, and the sandy areas between the ridges of the Tian Shan. Between the Central Tian Shan and the Western Altai Ranges, intersected by the Aktag Altai, Targabat Altai, and Alai Tau Ranges, lies the depression known as the "Dzungar Gates," through which waves of Mongol nomads made their way into the Turan Lowland and thence into Eastern Europe in ancient times.

Between the mountain ranges run three routes into Sinkiang (see pp. 49, 420). The first follows the upper Irtysh and Urunga valleys, and along it runs a minor trail from Semipalatinsk. The second follows the Sassik Kul Zaisan and other lakes, forming the Dzungarian Strait, while the third runs along the Chuguchak valley, taking the road from Sergiupol, on the Turksib Railway, to Twiha, the capital of Sinkiang.

A fourth route, outside the Dzungarian depression, runs from Alma Ata over the mountains through Kulja to Wu-Su

on the Sinkiang road, while yet another, to the south of Kazakhstan, takes the ancient caravan route from the rail terminus of Andizhan into Kashgar and Yarkand in southwestern Sinkiang (now called Shu-fu and So-chu).

The northern ranges of the Tian Shan rise majestically above the dry steppe and desert plains. The loess soils at the foot of the mountains are watered from the streams which originate in the melting snows and glaciers of the mountain heights. They support rich gardens and fields.

Climate and Vegetation

Kazakhstan, situated far from the oceans, has a dry, extreme continental climate. The summers are very hot, with great variation between day and night temperatures. During January temperatures below -4° F. are experienced in the north, rising in the south to about 18° F. The snow cover is insignificant. There are only three to four frost-free months, but during these months the sun shines from a blue, burning sky. The weather is dry and hot, with frequent dust-storms. The summer rains are very slight, and indeed it frequently happens that not a drop of rain falls.

Life is limited everywhere by the lack of moisture. The northern part of Kazakhstan is favoured with an annual precipitation of 8 to 10 inches, and lies within the black earth steppe zone. There is a greater prevalence of the solonchak formation than in the steppe of European Russia. Near the rivers, such as the Irtysh, the grass vegetation is most rich. To the south the chestnut and brown soil zone supports a poor steppe vegetation, where water is scarce, and gradually changes to the clay and sandy desert and semi-desert zone, where there is a considerable development of salt-accumulation near the surface. Large expanses of the land are barren and stony or covered with gravel.

The banks of the salt lakes and streams are clothed with thickets of rushes and reeds, which sometimes break the brown monotony of the landscape. For example, the Sara Su, one of the most notable of the rivers which flow from the

Kazakh Upland towards the Syr Darya, and once the greatest waterway of Central Kazakhstan, is now almost everywhere overgrown with vegetation, and in summer is very shallow.

The banks of the river rise to a height of 45 to 60 feet. The sides of the valley are clothed with grass, while the open, flat plains above are barren and stony. There are many tributary streams which come to life only during the spring and form damp salty reaches during the summer. They are gradually becoming overgrown with marsh plants, reeds, bulrushes, and water-lilies. Along the narrow depressions formed by these tributary valleys are rich meadows, carpeted with colourful flowers in spring—veronica, aster, tansy, wild geranium, etc. The air is fragrant with the scent of the wild rose. Many kinds of wild-fowl live in the marsh-thickets.

The valleys also contain fresh-water springs and wells, and these places are generally chosen by the Kazakh herdsmen for their winter quarters.

The steppe on either side of the Sary Su is the home of badgers, wolves, foxes, and rabbits, which are hunted by the Kazakhs. The grass is thick, while in the hollows, where the ground water comes near to the surface, there are large patches of *chi*—a type of reed which grows to a great height. The stems are used for making mats.

There is no doubt that the Sary Su steppe could support much larger herds of cattle and sheep, and in the future it will probably provide meat, leather, and wool for the industrial centres of Dzhezkazgan and Karaganda.

The upper part of the valley is followed by the new railway which runs to Dzhezkazgan, and in the highlands on either side iron (in sufficient quantities to create a strong magnetic anomaly), wolfram, and olivine have been found. There is certainly enough of these minerals for industrial exploitation.

Farther to the east the land becomes monotonous and lifeless. Travelling along the Turkestan-Siberian Railway, one passes over miles of arid country, where there is nothing to attract the eye but an occasional caravan of camels, or an encampment of Kazakh *yurta*, surrounded by flocks of sheep

and herds of cattle, which feed on the scanty scrub and saline vegetation.

The sand deserts are distinguished by the *barkhani*, or crescent-shaped dunes. During the spring some of the smaller depressions contain a little very saline water. As soon as summer comes it evaporates, leaving behind a thick deposit of salt.

The clay deserts are level grey expanses broken by deep cracks into irregular shapes, giving the country the appearance of a huge asphalt-covered square, cracked by the heat of the sun, and so hard that no spade could dig into it. There is a complete absence of water and no vegetation of any kind.

Near the mountain borders, in the east and south-east of the republic, the river valleys are fertile oases in an arid land. Above the rich gardens, meadows, and fields, the lower mountain slopes are covered with deciduous forests succeeded by a zone of coniferous forests, and then a zone of Alpine pastures, above which tower the snow-clad mountain peaks.

Agriculture

For centuries the steppe and dry steppe lands of Kazakhstan have been the home of nomadic herdsmen. Many travellers have written descriptions of the Kazakh encampments—a group of *jurta*, a fire of dung, for there is no wood for fuel, and horses, camels, sheep, and cattle grazing on the poor scrub and grass in the midst of flat, monotonous plains.

Hundreds of years ago settled life had developed near the rivers along the borders of the mountains in the south-east. Irrigation works were constructed, and many rich feudal states grew up long before the Russians came to colonize these lands. Across Kazakhstan there were trade routes from China, India, Mesopotamia, and Egypt.

When the Tsarist colonizers came to Kazakhstan they seized the more fertile lands for themselves. The feudal organization of the natives continued, but large numbers of Kazakhs were compelled to seek a precarious nomadic living in the more barren, arid central part of their country.

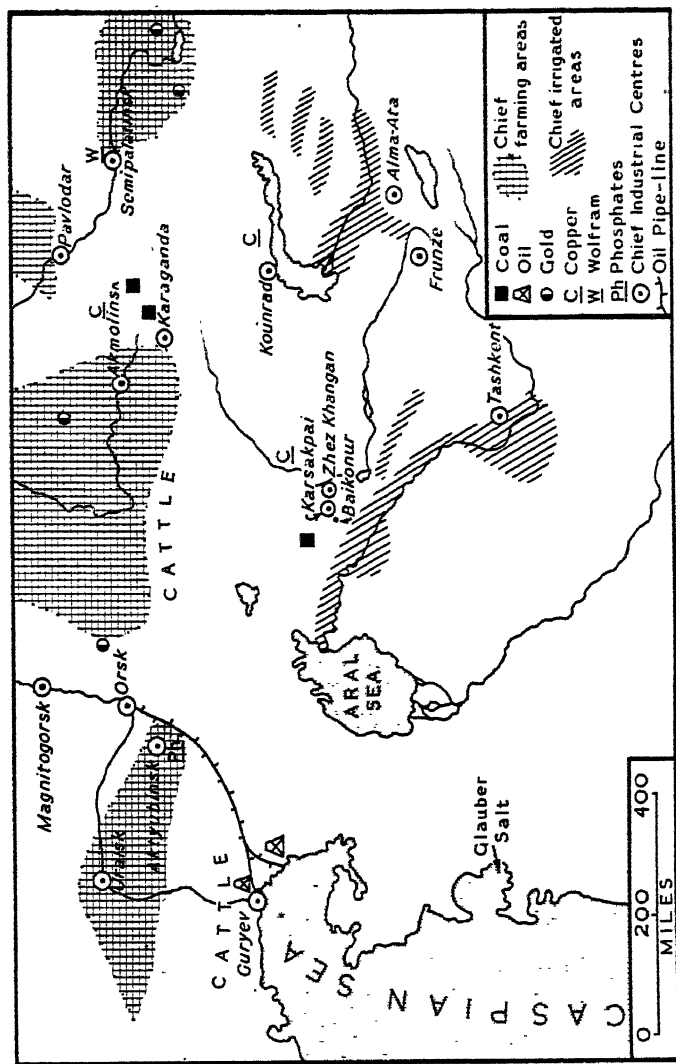


Fig. 40. KAZAKHISTAN: RESOURCES

During the last twenty years, however, great changes have taken place. Both the sown area and the variety of crops have been increased. Modern farming technique has been introduced, and by 1939 more than 25,000 tractors and nearly 10,000 combine-harvesters were at work on the farms, harvesting $12\frac{1}{2}$ million acres of grain (see p. 222).

Kazakhstan may be divided into the following agricultural regions:

The Black Soil Woodland Steppe Region. This comprises a narrow belt of land along the northern border of Kazakhstan which has a climate less subject to drought than elsewhere, and good soils. There are large state farms, devoted to grain production, particularly wheat, together with beet, especially near the Irtysh and Tobol rivers.

The Drier Feather Grass Steppe. This region lies to the south of the woodland steppe, and is distinguished by chestnut and brown soils, which are fertile, but with a limited capacity for crops, owing to the low precipitation, which falls to 8 inches or less. There is some extensive dry farming, for wheat production, but the most important occupation is the raising of cattle and sheep for meat and wool.¹

The Dry Steppe and Semi-desert Region of Central and South-west Kazakhstan. This region remains an area devoted entirely to animal husbandry. Sheep and camels predominate in these arid lands, and although there are still some vestiges of the nomadic way of life, a great deal has been done to organize the nomads in 'collective' farms, and to introduce more modern methods of animal husbandry. For example, the cutting of hay in the autumn is now practised in order to supply the animals with fodder in winter, and so prevent their death from starvation, a common occurrence in the past.

The Irrigated Valley Lands of the South-east. Rich loess soils occur along the valley of the Syr Darya and along the valleys of the streams which flow from the Altai and Tian Shan mountain systems. The climate is warm, and there is water

¹ Kazakhstan possessed 11 million head of livestock in 1937, and in 1939 exported 90,000 tons of beef, 200,000 tons of milk and butter products, and 8000 tons of wool to other parts of the U.S.S.R.

for irrigation. Hence such valuable crops as tobacco, grapes, fruit, rice, cotton, kender, and kenaf (see p. 214), and even sugar-beet are grown. Crop specialization has been introduced and developed to a very great extent. Rice cultivation has been concentrated in the Dzhietsu region in order to free the Syr Darya valley and the valleys and lower slopes of the Kartau Mountains for the growth of cotton. Cotton seed provides not only vegetable oil but a valuable source of fodder for cattle. The area under cotton has been further increased by importing wheat from the Novosibirsk region, thus removing the need to grow this crop in Kazakhstan. Rubber-yielding plants such as the handryll, tau-sagyz, etc., now occupy a considerable acreage.

KAZAKHSTAN: APPROXIMATE ACREAGES (IN THOUSAND ACRES)
UNDER CHIEF CROPS,¹ 1938

Total sown area	14,580
Grain	12,890
Cotton	277
Rice (1939)	65
Sugar-beet	32
Fodder crops	485
Irrigated area (1940)	2,945

Industry

The recent industrial development of Kazakhstan has proceeded on the basis of the utilization of the resources of coal, oil, non-ferrous metals, and salt on the one hand, and of the products of agriculture, especially cotton, on the other. Economically, the republic is closely linked with the Ural-Kuznetsk industrial combine, since it possesses about 50 per cent. of the entire non-ferrous metal deposits of the Soviet Union, and is able to supply copper, zinc, and lead to the metallurgical industries of the Urals and the Kuznetsk basin. The development of the chemical industry is of particular importance, because the use of chemical fertilizers makes possible a great increase in the yield of such crops as cotton.

¹ For number of livestock, tractors, and combines, see pp. 224-5. Kazakhstan not only supplies large quantities of wool and hides for industry, and meat and dairy products, but also rears large numbers of horses, used extensively in the Army.

One of the chief problems of industry has been the lack of water and the absence of wood. Saksaul, generally known as the 'wood of the desert,' is important only as a domestic and local fuel. Timber for constructional purposes must be brought by rail from the coniferous forests of the north or from the lower slopes of the Tian Shan and the Altai.

The Karaganda coal basin provides the fuel basis for the industries of Kazakhstan. Before the Russian Revolution the maximum annual output never exceeded 35,000 tons. To-day it exceeds 4,000,000 tons a year, and occupies third place in the output of the coalfields of the U.S.S.R. Coking coal is supplied not only to the industrial centres of Kazakhstan, but is also used by the great steel-works of Magnitogorsk in the Urals (see p. 230).

The coal basin is situated in the upland region of the higher, north-eastern section of Kazakhstan, an area of Palæozoic deposits. Close at hand, between the upper Irtysh and the Ishim rivers, there are extensive deposits of iron ore. Although the Karaganda mines are the main source of coal, there are others near Pavlodar, south-east of Chimkent, at Mangyshlak (on the Caspian), and near Karsak Pai (Fig. 40).

The second fuel base lies in the oil-wells near the river Emba. They constitute the third most important source of oil for the whole of the U.S.S.R., the output in 1940 amounting to about one million tons. The wells are connected by a pipeline, some 550 miles in length, with refineries at Orsk in the Chkalov region. There are also pipe-lines to Chapâyev, and Dossor-Rakusha. Oil-wells are also being developed in the Aktyubinsk district (see p. 232).¹

Within economic reach of the Karaganda coalfield there are important deposits of non-ferrous metals which are now being worked and refined with the aid of Karaganda coal. In copper, nickel (at Orsk), and lead reserves, Kazakhstan occupies first place in the Soviet Union. Of these metals, copper is the most important. The largest mines were opened in 1928, at Kounrad, to the north of Lake Balkhash. Large

¹ Hydro-electric stations form another important source of industrial power. Their output amounted to 290 million kw. h. in 1937.

quantities of water are required for the refining processes, so that the ore is taken to a new copper-refining plant at Prebalkhash, some 25 miles from the mines and situated on the shore of the lake. The annual output of copper from this plant is now 75,000 tons. A second refining centre has recently been established at Karsak Pai, utilizing the rich ore deposits of the Dzhezkazgan mines and coal from Baikonur. The three towns have been joined by a railway line, about 75 miles in length, recently extended to the Karaganda coal-field. It is expected that the output of the copper mines of this district will exceed that of the Lake Balkhash mines. Lead is refined at Chimkent, Ridder, and Ust-Kamenogorsk.

The chief centre of the chemical industry is Aktyubinsk. The deposits of phosphates which are found near the town are used as the basis for the manufacture of fertilizers. Nitrogen fertilizers are also manufactured. Salt for the chemical industry is obtained from the south shore of Lake Balkhash and from the north-eastern corner of the Sea of Aral. Aktyubinsk, besides being the centre of the chemical industry, also lies close to some very important deposits of chrome and nickel.¹ Both the chemical and the non-ferrous metal industries serve the Ural-Kuznetsk combine, with which they are connected by rail.

There are several other industries in Kazakhstan, based upon agricultural products. At Semipalatinsk there is a large meat-packing plant, at Alma Ata there are fruit-preserving factories and textile mills, and at Karaganda flour-mills. Other industries are concerned with tanning, leather manufacture, wool-washing, cotton-cleaning, and the extraction of vegetable oil from cotton seed.

Communications

The industrial expansion which has taken place in Kazakhstan is reflected in the enormous growth of the railway system. Before 1917 there was only one railway for the whole of this

¹ About 50 per cent. of the known reserves of nickel in the Soviet Union occur near Aktyubinsk. It is now an important centre for the production of nickel and the manufacture of synthetic rubber.

vast area—from Orenburg to Tashkent. Camel caravans were the usual means of transport. But when it was decided that the industries of the Asiatic republics were to be planned in conjunction with those of Western Siberia and the Urals it was obviously of first importance to provide new means of transport. Altogether over 4000 miles of new railways have been built. The first step was to connect Novosibirsk with Tashkent and Alma Ata, and for this purpose the Turksib (Turkestan-Siberian) line was laid down, traversing nearly 1000 miles of arid country along the old camel route. To-day fast oil-fuelled locomotives or steam locomotives fitted with special condensers to conserve water do the journey in just over four days. Tashkent is the terminus of the old line from Chkalov, so that with the construction of the new line Kazakhstan was completely circled by a railway system. As a result of this it is now possible to supply Kazakhstan and Central Asia with wheat and timber from the north, and send back in return cotton, coal, and metal.

From this outer circle branch lines were laid down—from Petropavlovsk to Karaganda and the northern shore of Lake Balkhash, with a junction at Akmolinsk from which ran a line to Magnitogorsk and the Urals. Thus Karaganda coal is now sent both to the Urals and to the copper refineries of Prebalkhash. Another railway was constructed from Semipalatinsk via Karaganda to Dzhezkazgan and Baikonur. In this way the new Karaganda industrial region has become a focal point for transport from Western Siberia and the Urals. Smaller lines have been built in the north-east, joining the towns of Ridder and Pavlodar with the main Turksib and Trans-Siberian lines. The only waterway of any importance for transport is the Irtysh. Several modern motor-roads have been built, and most of the important towns of Eastern Kazakhstan are now linked by excellent highways.

• Towns and Population

Further evidence of industrial expansion is provided by the large increase in the urban population, which has more

than trebled since 1917. It now amounts to about 28 per cent. of the whole. The old towns have grown rapidly. Alma Ata, the administrative centre, had grown from a town of 45,000 inhabitants in 1926 to a town with a population of 230,500 in 1939.

Semipalatinsk is situated at the point where the Turksib Railway crosses the navigable Irtysh, and lies in the middle of steppe land of great agricultural value. It was a small place with a population of 57,000 in 1926. By 1939 it had risen to 110,000.

The new industrial towns have exhibited an even more remarkable growth. More people live in Karaganda than in Semipalatinsk. There was no town on the coalfield in 1926. To-day 165,937 people live and work there. Another new town has grown up around the copper refineries on the north shore of Lake Balkhash. Although it was founded only in 1928, Prebalkhash to-day has a population of 50,000. Many difficult problems had to be solved in the construction of towns in the semi-desert. Water is needed for domestic purposes, as well as for industry. Irrigation is necessary on the local farms which have been established to supply the townsfolk with food. Kounrad, Karsak Pai, and Ridder all have populations exceeding 10,000.

The average density of population in Kazakhstan is naturally very low, owing to the large tracts of arid land within the republic. Although the territory is about six times larger than Germany, the population is only 6,000,000. Between Lake Balkhash and the Aral Sea and on the Ust-Urt Plateau the average density falls below 1 person to 10 square kilometres. Apart from the industrial areas, the most thickly peopled areas are in the steppe lands of the north-east, along the valleys of the Irtysh and the streams which flow from the Altai, and in the irrigated regions of the south.

Two-thirds of the people are Kazakhs, a people belonging to the Turkic group. The rest are mainly Russian.

Kazakhstan represents a transitional region between European Russia to the west and Siberia to the north, and the Asiatic part of the Soviet Union. The change from Siberia

to Asia is obvious to the traveller who leaves Semipalatinsk for the south on the Turksib Railway. The countryside becomes drier and less cultivated. Finally, the poor steppe vegetation is replaced by sand. Kazakh horsemen may be seen, dressed in cloaks and caps of grey felt. Occasionally there is a group of *yurta*, surrounded by camels and sheep. Where the railway crosses the valley of the Ili the burning sands give way to fields of cotton, maize, hay, fruit, and vegetables, with neatly thatched cottages or old-fashioned round huts made from sun-dried bricks, and having a cake-like appearance. In the towns of the south old clashes with new; camels make their leisurely way through streets crowded with motor-cars and lorries. Oriental dress may be seen side by side with European.

The squalid mud huts and the ruined temples of an ancient civilization still remain in the shadow of modern stone and concrete flats, office-buildings and factories, schools, hospitals, theatres, and parks, the signs of the new civilization which has so rapidly transformed Kazakhstan during the short space of twenty years.

THE SOUTHERN REPUBLICS OF SOVIET CENTRAL ASIA¹

PHYSICAL FEATURES

Central Asia is a land of contrasts. Large rivers, the Syr Darya and Amu Darya, flow through barren deserts. From green oases one can see endless expanses of sand on the one hand, and majestic snow-capped mountain summits on the other. Physically and structurally, Central Asia is divided into a north-western lowland, the southern continuation of the lowland of Kazakhstan, occupying about two-thirds of the total area, and a south-eastern mountainous region.

¹ These are the Turkmenian S.S.R., the Uzbek S.S.R. (including the Kara Kalpak A.S.S.R.), the Tadjik S.S.R. (including the Gorno-Badakhshan Autonomous Province), and the Kirghiz S.S.R.

THE NORTH-WESTERN LOWLAND

This lowland extends southward from the Ust-Urt Plateau and the Syr Darya river. It includes the great deserts of Kara Kum and Kizil Kum, and forms an extension of the Turan Lowland, the bed of a former sea, covered with Quaternary deposits.

Separated from the Kizil Kum by the river Amu Darya, the Kara Kum Desert is for the most part a sea of sand of yellow or greyish colour. Wide expanses are covered with wind-formed ripple-like ridges, which, seen from an aeroplane, give the country the appearance of a vast sea-shore. In other parts, especially towards the east, the landscape is one of gigantic waves of sand, crescent-shaped hills, or *barkhani*, of æolian origin, rising to a height of more than 30 feet. Occasional small areas of cultivated land appear like green islands in the midst of this sandy sea.

There are frequent sandstorms, and the hills are constantly shifting and changing their position.

Amid these vast areas of sand there are tracts of clay desert, dirty and muddy in spring, when the light snow cover melts, but as hard as stone in summer. In places the land rises in fantastically eroded clay hills.

In some parts of the Kara Kum there are deep dry valleys, the largest of which, known as the Uzboi, extending for several hundred miles, was probably the original valley of the Amu Darya. This river once flowed into the Caspian Sea by way of the Sarikamish depression, which to-day lies below the level of the sea.

The slight increase in precipitation towards the south-east is responsible for the replacement of the barren sands by a covering of poor steppe vegetation, while close to the Kopet Dag Range, and along the banks of the Tedzhan and Murgab rivers and the lower Amu Darya, there are narrow belts of cultivated land. Through the centre of the Kara Kum runs a range of broken and eroded mountains, the remnants of an ancient mountain system.

The Kizil Kum Desert has a greater extent of poor steppe

vegetation than the Kara Kum. It extends in wide gulfs along the floors of the depressions between the ranges of the Tian Shan and Pamiro-Alai Mountains. One of the most important of these is the Ferghana depression, lying between the Hercynian folds of the Ferghana and Chatkhalsk Mountains and the Turkestan and Alai Ranges.

Generally speaking, the Kizil Kum is much better supplied with water than the Kara Kum, since from the mountains rise several rivers of great value for irrigation.

THE MOUNTAINS OF THE TIAN SHAN, PAMIRO-ALAI, AND KOPET DAG RANGES

In Central Asia we find the greatest mountain systems, the highest peaks, and the most extensive glaciers and snow-fields in the Soviet Union. The greatest glacier in the world, with a length of about 50 miles, is the famous Fedchenko Glacier, in the Salaisk Range. The majestic snow-covered ranges of the Asiatic republic form the strongest and most impenetrable natural frontier of the U.S.S.R.

Through the southern ranges of the Tian Shan and the northern ranges of the Pamiro-Alai runs the junction between the Hercynian and Tertiary systems of folded mountains. The Tian Shan is distinguished by the wide depressions between the ranges, while the Pamiro-Alai forms a more compact and less eroded mountain mass, with sharply defined crests and peaks, including Mount Stalin (24,590 feet) and Mount Lenin (23,680 feet). The valleys of the Pamiro-Alai are deep, often precipitous, gorges; the rivers are powerful and torrential.

In the south-west of the Central Asiatic republics the Alpine folds of the Hindu-Kush system are represented by the Kopet Dag Range, considerably lower than the ranges of the Tian Shan or Pamiro-Alai, and extending to the shores of the Caspian Sea in the Balkhan Mountains.

Apart from their value as sources of hydro-electric power and water for irrigation, the mountain systems described above contain deposits of coal, oil, non-ferrous metals, radio-

active and rare metals, mercury, and gold. In the lowlands near the shores of the Caspian Sea there are very important resources of oil and glauber salts.

THE RIVERS

Central Asia constitutes a vast inland drainage basin, from which not a single drop of water flows into the oceans, and the only rivers of any significant size, the Syr Darya and the Amu Darya, flow into the Aral Sea. The two latter rivers are fed by the melting snows and glaciers of the Tian Shan and Pamiro-Alai respectively. The Amu Darya is navigable for river boats, but navigation is hindered by the presence of shoals and shifting sandbanks, while the river enters the Aral Sea through a wide delta, traversed by numerous small channels. The Syr Darya is neither as deep, nor is the volume so great, as that of the Amu Darya. But it is joined by more tributaries which are used for irrigation, and it flows through the extremely fertile Ferghana depression. Like the Amu Darya, it forms a large delta at its entrance into the Aral Sea.

These two rivers and their tributaries are of importance, since they supply water to about one-half of the cultivated lands of the Central Asiatic republics, which they serve in much the same way as the Nile serves Egypt. The river Chu occupies a similar position in the Kirghiz Republic. Its wide valley supports one-third of the total population, a quarter of the farmland, and one-fifth of the cattle. The river is used for the irrigation of extensive areas of former arid land.

CLIMATE AND VEGETATION

Like Kazakhstan, the Central Asiatic republics are situated far from the tempering effects of the oceans. The climate, dry and extremely continental in character, is a combination of Siberian winters with Egyptian summers. In the south, in spite of occasional severe winter frosts and the possibility of light snowfall at any time between December and February, the January temperature is above 32° F.

The transition from the cold of February to the warm summer month of May, when grain is ripening in the fields and apricots are ready for picking, is remarkably sudden. During the hot summer dry, withering winds prevail. The weather is as hot as in the Sahara, and in the deserts sandstorms blot out the sun, filling the air with fine yellow dust. Only in the foothills of the mountains does rain fall to refresh the vegetation. The most comfortable time of the year is the warm autumn. In the highlands, of course, temperatures decrease with altitude.

In the south poor steppe vegetation covers both plains and the mountain slopes, while there are numerous examples of the 'solonchak' formation (see p. 115). Forests and woods occur only on the higher mountain slopes, and occasionally are found on the banks of rivers. By far the largest proportion of the land is covered by the deserts which have been described above.

Much of the steppe vegetation is patchy, and consists largely of low bushes, rather than a continuous expanse of grassland. Many of the plants which grow in the dry steppe are thick and prickly, covered with fine hairs to reduce evaporation. The saksaul is the only kind of tree to be seen. There are other plants which possess exceptionally long roots, and these are being planted on a large scale in order to prevent the movement of sand and its encroachment upon irrigated lands. It is believed that vegetation of this type once covered considerable areas of land which to-day form barren desert, but since it provided good grazing it was gradually killed off by the irrational pasturing of flocks and herds by nomadic peoples.

The salt-marshes and the banks of rivers are clothed with tall rushes and reeds, used by the native peoples for the thatching of roofs, and the making of mats. Together with the poplar, aspen, and willow-trees they often form dense thickets.

In the Kara Kalpak A.S.S.R.—part of the Uzbek Republic—lies the delta of the Amu Darya. Here, close to the shores of the Aral Sea, is an area of dense jungle which extends for

many miles. Reeds grow to a height of 15 feet, and among them tigers, panthers, jackals, antelopes, hyenas, wolves, pelicans, and swans make their homes.

The higher mountain slopes of the south-east support a variety of deciduous and coniferous trees, as well as wild apricots and nut-trees, and alpine pasture at higher altitudes.

AGRICULTURE

In spite of the fact that large areas of Central Asia are covered with a steppe vegetation which can support nothing more than cattle and sheep, a very small portion of the population is able to live by animal husbandry. Most of the people are occupied in the cultivation of the land, and are concentrated in the south, where highly mechanized and intensive farming is practised. There are three main types of agricultural occupations.

Intensive Irrigated Agriculture and Horticulture

In the south there are thick deposits of loess, extremely fertile, but needing irrigation. The irrigated lands, although forming only 2 or 3 per cent. of the total surface of the land, support the greater part of the population, and are of immense importance to the Soviet Union since they supply a large proportion of the cotton used in the U.S.S.R.

Near the rivers, in the depressions between the mountain ranges and along the banks of the Syr Darya, the Amu Darya, and the Chu, the irrigated lands form oases in the midst of poor steppe and desert country. The best rivers for irrigation are those which are fairly shallow and carry a large quantity of silt and mud. The larger and fast-flowing rivers are difficult to regulate. A great deal of labour is needed to maintain the irrigation works, but the fertile loess soils and warm, cloudless, sunny weather during the summer amply repay this labour by giving a high yield of crops per acre, so that the land is able to support a very dense population.

Owing to lack of fodder there is practically no cattle-rearing, and only as many animals as are necessary for farm

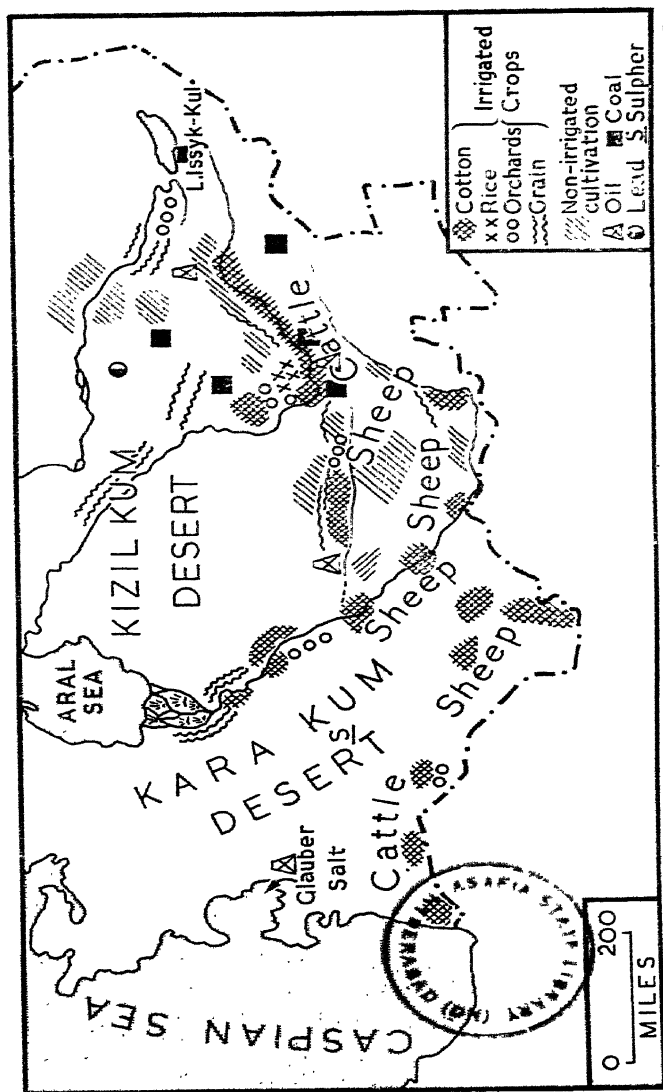


Fig. 42. THE CENTRAL ASIATIC REPUBLICS: RESOURCES

work are kept. Frequently draught animals are brought to the farms from the cattle-rearing regions during the spring, and sent back again at the end of the summer when the greater part of the farm work has been done. Another interesting feature of life in the irrigated lands is the growing of trees such as the poplar by the sides of streams and water-channels, as a crop, for timber is practically unobtainable locally.

The irrigated lands form oases separated from each other by large areas of dry steppe and sandy desert. The largest area of cultivation is situated around and to the south-east of Tashkent, in Uzbekistan, along the banks of the upper Syr Darya and its tributaries, which flow through the large depression between the Tian Shan and Pamiro-Alai mountain systems. The new Ferghana Canal is 170 miles long and provides water for over 12,000 acres of grain as well as potatoes, cucumbers, and tomatoes (in the Uzbek, Tadjik, and Kirghiz republics). The soils and climate create together such favourable conditions that two harvests a year are usual. The richest and most densely populated part of this region is the Ferghana valley. Protected from cold winds by some of the world's highest mountains, which almost completely encircle it, it consists of a flat valley floor covered by a thick network of irrigation channels, with poplars and willows growing along their banks. It has been described as one of the great natural gardens of the world. Cotton and sugar-beet are the chief crops.¹ Near Tashkent a large part of the irrigated land is under rice.

Another area of cultivation, situated between the foothills of the mountain chains, lies around Samarkand in Uzbekistan. To the west there are several small 'oases' along the Zeravshana valley, between Samarkand and Bokhara, another centre of intensive irrigated agriculture. In the Bokhara district there are eighty main canals, supplying water to about 1600 square miles of fertile loess soil. The amount of water which is used by the irrigation schemes is so great that

¹ About 37,000 acres of land are devoted to sugar-beet. Two large refineries in the Chirchik valley produced 44,500 tons of sugar in 1937.

the Zeravshan is reduced to a tiny stream which loses itself in the sands some twenty miles from the Amu Darya.

All these fertile oases were centres of ancient civilized states. Practically all the wars between the various states may be described as 'water-wars,' for the possession of water was the

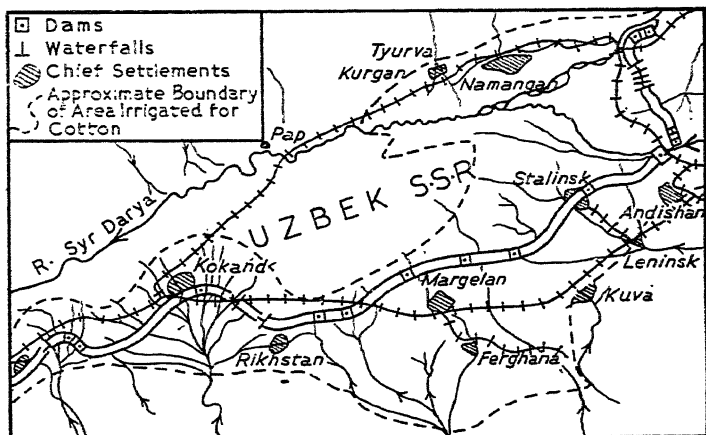


FIG. 43. THE GREAT FERGHANA CANAL
After a map in "U.S.S.R. in Construction"

key to wealth. Along the Zeravshan depression ran the ancient caravan route from China to Bokhara, where it was joined by another track which went through the Ferghana valley, crossing the mountains by means of passes at an altitude of 13,000 feet. From Bokhara caravan routes branched out to Persia, Afghanistan, and Europe. These ancient states were eventually overcome by the attacks of nomadic tribes, and many of the irrigation systems, the work of centuries, were destroyed. Within a short time the sands of the deserts had encroached upon the fertile oases, and it is only within the last few years that some of them have again expanded to their original extent.

Other irrigated areas are situated in the extreme south, near

Tedzhen, on the Tedzhen river; near Merv, on the Murgab river (both in Turkmenistan), near Termez on the upper Amu Darya around Khiva, on the lower course, and near Stalinabad. Extensive new irrigation works have been completed near the northern borders of the Kirghiz Republic, utilizing the water of the river Chu, and 200,000 acres of barren land have been brought under cultivation for grain and cotton.¹

In all the oases cotton is the chief crop. It is displacing to a large extent both rice and wheat. The latter is now brought by rail from Western Siberia, and the former from Dzhietsu, in South Kazakhstan. In Uzbekistan, which possesses the largest amount of land under cultivation in the whole of Soviet Central Asia, 60 per cent. of the entire Soviet cotton crop is grown. An increasing proportion of Egyptian long-staple cotton is now being cultivated, although formerly its cultivation was considered to be quite impossible, and only inferior types of American cotton were grown. A new irrigated region for the cultivation of Egyptian cotton, covering over 100,000 acres of land, has been brought into use in the valley of the river Vakhsha, in Tadjikistan. Protected from north winds by the surrounding mountains, this is one of the warmest parts of Central Asia.

Generally speaking, the Asiatic republics are quite suitable for the growth of cotton, which requires a fertile soil, plenty of water for the roots, and an abundance of sunshine for the growth of the leaves. The success of cotton cultivation in these regions is demonstrated by the following facts:

In 1938 750,000 tons of cotton were produced (see p. 208). The yield of raw cotton had risen to 12 cwt. per acre by 1938, and is now generally twice that attained in the U.S.A. One-third of the total income of the farmers came from the sale of the cotton crop, which constitutes more than two-thirds of the exports from Central Asia to other parts of the Soviet Union.

¹ Several hundred thousand acres of land are irrigated by canals constructed during the last nine or ten years. The North Tashkent Canal, completed in 1942, will irrigate a further 125,000 acres, and a dam under construction in the Katta-Kurghan valley of Uzbekistan will create a reservoir ten times larger than Lake Meade, at Boulder Dam in the U.S.A.

SOVIET CENTRAL ASIA: APPROXIMATE ACREAGES (IN THOUSAND ACRES) OF CHIEF CROPS,¹ 1939

	GRAIN	COTTON	RICE	LUCERNE	IRRIGATED AREA	OTHER CROPS
Tadjik S.S.R.	1440 (excl. rice)	275 ²	---	---	750	Lucerne
Turkmen S.S.R. ³	472	385 ⁴	---	90	---	Pistachio nut (65,000 acres), silk, grapes, figs, almonds, Mexican rubber-trees
Uzbek S.S.R.	3715	2296	200 ⁵	870 ⁶	3000	Silk (50 per cent. U.S.S.R. production), jute, fruits, and vine
Kirghiz S.S.R.	2000 (incl. rice)	162	---	---	1925	Sugar-beet (39,000 acres), ⁷ tobacco (10,000 acres) ⁸

¹ Numbers of livestock, tractors, and combines are given at pp. 224, 225.

² Egyptian 75.

³ Figures for 1938.

⁴ Egyptian 60. ⁵ Nearly half U.S.S.R. total.

⁶ Mostly irrigated.

⁷ 1940 figures.

⁸ 1939 figures.

About $2\frac{1}{2}$ million acres are now devoted to cotton in Uzbekistan, and in 1938 the average yield of raw cotton was 13.4 cwt. per acre, the highest average in all the Central Asiatic republics. In 1942, 170,000 acres of land were planted with sugar-beet, and the grain crops increased to one million acres, without decreasing the area under cotton.

In Turkmenistan, of the 900,000 acres of cultivated land (1937), 350,000 acres were under cotton, and the production was 116,000 tons. In 1938 275,000 acres of cotton were planted in the valleys of Tadjikistan. This republic produced 180,000 tons of Egyptian cotton—mainly grown in the Vakhsha valley. In the Kirghiz Republic there are 160,000 acres of cotton plantations in the Ferghana valley.

In addition to the large-scale cultivation of this crop, orchard cultivation is most important. The vine, raisins, apricots, peaches, pears, figs, apples, and melons are grown. Although the area under cotton has greatly increased there are still important crops of poppy-seed, rice, castor-oil plant, tobacco, sugar-beet, and beans, while lucerne, the seed of which is exported abroad as well as to other parts of the U.S.S.R., is a fodder crop which is planted in rotation with the cotton.

The cultivation of the silkworm is also carried on, and forms the basis for a large section of the textile industry.

Until very recently silk production remained a cottage industry, each garden containing mulberry-trees, and the silkworm breeders working in their own homes. Under the stress of war, however, the cottage industry has been transformed into a large-scale co-operative industry, with large new mulberry plantations, and nurseries for the breeding of the larvæ of selected varieties of silkworm.

By 1941 the system of 'double-feeding' of the worms, and uninterrupted day and night feeding, had become a widespread practice. In Uzbekistan a certain silkworm cultivator found that after the spring feeding he obtained 133 kilograms of cocoon from his worms. He then began feeding them a second time, and obtained a further yield of 95 kilograms. Another pioneer in this method obtained a yield of 134.4 kilograms from one box of worms.

These new methods have been adopted on a wide scale, so that in the first year of the German-Soviet war Uzbekistan alone provided more than a million square yards of silk in excess of the planned output.

In the irrigated oases collective and state farms have replaced the feudal system of agriculture which continued until after 1917. Mechanization—even the use of machines for picking cotton—has been introduced to such an extent that in the Kirghiz and Tadjik Republics alone more than 8000 tractors are in use, and about 800 combined harvesters. Finally, the yield per acre has been increased by the utilization of artificial fertilizers produced in the newly constructed centres of the chemical industry, such as the big hydro-electric chemical plant at Chirchik, near Tashkent.

'Bogarni' Cultivation

Close to the mountains and in the high valley lands among the foothills there is sufficient precipitation to allow non-irrigated, or 'Bogarni,' agriculture. Cereals predominate on the farms of these districts, which are most common in the mountainous region of Badakhshan. Wheat, barley, and millet are the main crops, and large herds and flocks are reared for the production of meat and butter. The flocks and herds are taken up to the mountain pastures, far from the villages, during the summer, returning to the plains and valleys in October.

Pastoral Regions

The least populated lands, occupying the largest area, are in the mountain, steppe, and semi-desert zones. Although cattle are reared, sheep and camels are more important, and since the Soviet Government turned its attention to the planning of agriculture a great deal of attention has been paid to the growth of fodder crops and the production of hay. The largest regions of steppe land are to be found in Turkmenistan and the Kara Kalpak A.S.S.R. In the latter cultivation of lucerne for seed is the most important occupation.

The seed is exported to many parts of the world, including the U.S.A. Alfalfa crops are also grown. In the past inferior breeds of sheep were reared, and wool-production was limited to the coarser varieties. But to-day attention is being paid to the breeding of merino, caracaul, and Astrakhan sheep. The rearing of the valuable caracaul sheep is one of the oldest occupations of the agricultural population of Uzbekistan. Certain collective farms possess 30,000 or more head of sheep, and some state farms possess as many as 100,000. Uzbekistan is one of the world's leading producers of Persian lamb, providing a large surplus for export.

Merino sheep now constitute about 60 per cent. of the flocks in the Kirghiz Republic. During the winter the flocks graze on the plains. In summer they migrate to the mountain pastures. The nomad Kirghiz peoples wander across vast areas in search of pasture, often travelling for nearly 1000 miles during a year. Thus the organizing of these nomads into collective farms, similar to the great American ranches, is of the greatest importance, since it enables expert advice to be given and instruction in more modern methods of sheep and cattle-breeding; it also makes possible the introduction of new breeds, the sowing of plants which will provide more fodder, and the harvesting of hay in the autumn, thus reducing the extent of the pastures which have to be traversed by the shepherds and herdsmen.

In the Kirghiz S.S.R. horse-breeding is a particularly important occupation among the stock-breeders. The Kirghiz horse is a descendant of the sturdy Mongolian breed, used by Mongolian tribes over 2000 years ago. Of course, the breed has been improved—in recent years by crossing with English and Don strains. To-day the horses from the pastures of the Chu and Talass valleys and the foothills of the Kirghiz Range are renowned throughout the Soviet Union.

INDUSTRY

The ancient civilizations of Central Asia possessed a well-developed system of handicraft industry—metal-work, pottery,

and carpet manufacturing. But when the region became a Russian colony at the end of the nineteenth century these handicrafts were largely displaced by the introduction of cheap manufactured goods, while the wealth of the country—silk, cotton, hides and skins, and wool—was exported to European Russia as raw materials for Russian industry, and the manufacture of these materials in the country of origin was not allowed. To-day the industrial output exceeds that of Iran, Afghanistan, and Turkey together.

Central Asia is a vital link in the industrial plan for the entire Soviet Union, working as an economic unit in conjunction with Western Siberia, the Urals, and European Russia, specializing to a large extent in the cultivation and manufacture of cotton and silk. This entailed the development of local fuel resources, a chemical industry to supply the needs of agriculture (artificial fertilizers), and a machine-building industry (making necessary in turn the establishment of metallurgy) to supply the factories and farms.

The main areas of coal production are shown in Fig. 42. The annual production from the mines in the centre of the Kirghiz Republic had reached 1,500,000 tons in 1939, while the new mines at Angren, near Tashkent, are of great importance. Oil-wells have been established in the Ferghana valley, near Bokhara (Uzbekistan), and at Nefte Dag, on the shores of the Caspian Sea. The annual production of the Uzbek oilfields now exceeds 700,000 tons, and about one half is refined locally.¹ Water power is also utilized. There are enormous reserves in the rivers which rise in the mountains, thousands of feet above the level of the lowlands. The river Chu has been harnessed to supply the Kirghiz Republic with electricity. The swift Tadjik rivers have been harnessed to supply power to the isolated Vakhsh and Stalinabad valleys. Two very large hydro-electric stations have been built on the river Chirchik,² one of the rivers which joins the Syr Darya to the east of Tashkent. These stations supply power for the manufacture of nitrogenous fertilizers at Tashkent.

¹ Also 452,000 tons from the Caspian wells in 1938.

² The capacity is 270,000 kw

Hydrogen is obtained from water by electrolysis, and is then combined with the nitrogen in the atmosphere to create ammonia gas, from which the fertilizers are made. Thus the two essential raw materials for this industry are water (including water power) and air.

By the shores of the Caspian Sea, at Kara Bogaz, are the largest deposits of glauber salts in the world.¹ Over five thousand people are employed here completing or working in a large chemical plant, which produces sulphates, sulphuric acid, iodine, bromide, etc. Coal from Mangyshlak and Tuarkip (to the north and east of Kara Bogaz), and local deposits of lime, oil, and natural gas, are used. Another chemical industry has been established in the middle of the Kara Kum Desert, where there are valuable deposits of sulphur. In a waterless and barren countryside near the frontier between the Turkmenian S.S.R. and Afghanistan, close to the river Amu Darya, huge deposits of high-quality sulphur have been discovered recently, and together with potassium deposits are used at a new chemical works.

Non-ferrous metals are mined at Amalyk, Kara Mazar, near Tashkent, and in the mountains of the Kirghiz and Tadjik Republics, where gold, radium, platinum, bismuth, arsenic, lead, and tin are found. South of the Ferghana valley are the largest mercury-mines of the Soviet Union. In the Turkmen S.S.R. there are large deposits of potash.

The Uzbek S.S.R. is the third largest producer of copper in the U.S.S.R., the chief mines being about 50 miles from Tashkent, at Amalyk.² Wolfram and molybdenum are also found in this republic.

The most important industries, however, are those which are based upon the products of agriculture, and of these the textile industry occupies the first place. Both silk and cotton are manufactured. At Tashkent cotton-mills larger than any in Europe have been constructed, with a capacity for the production of 67·5 million yards of cloth per year.³ The

¹ See p. 245.

² The Amalyk refinery produces 75,000 tons of copper per year.

³ The mills have in operation 112,000 spindles and 3200 looms.

largest silk-mills are situated at Leninabad. There are other silk-mills at Osh, Tashkent, Kokand, and Stalinabad, and cotton-mills at Ashkabad, Ferghana, and Frunze.

Other industries include the manufacture of vegetable oil from cotton seed, and agricultural and textile machinery at Tashkent. Fruit-preserving, including fruit-canning on a large scale (*e.g.*, at Leninabad), tanning, leather and boot manufacture, and various processes of the food industry are carried on in several towns. In the Kirghiz Republic there are large sugar factories (*e.g.*, at Frunze) which utilize sugar-beet grown on local farms. At Ashkabad and Stalinabad there are meat combines capable of dealing with the entire cattle production of the Asiatic republics.

POPULATION

If Kazakhstan be included the population of the Asiatic part of the U.S.S.R., an area ten times as large as that of Germany, is 17,000,000.¹ But, as in Egypt, without water there can be no life, so that the greater part of this immense region is sparsely peopled, and there is a high density of population only in the irrigated valleys of the south and south-east.

Excluding Kazakhstan, about 14 per cent. of the population is composed of Tadjiks, native farmers who form the remnants of the ancient Iranian population of Central Asia. At a later period in history the land was invaded by nomadic Turkic tribes, Uzbeks, Turkmens, and Kirghiz peoples. The Uzbeks to-day constitute about 50 per cent. of the entire population. They represent a mixture of the aboriginal peoples with Turkic stock. The Kirghiz people have remained as a predominantly nomadic group until recent times. Apart from the Tadjiks, who speak a language close to that spoken to-day in Iran, all the nationalities speak languages belonging to the Turkic group, and closely related to Turkish, as spoken in Turkey.

Under the Soviet Government the territories of each of the

¹ The four republics of Uzbekistan, Turkmenia, Tadjikistan, and Kirghizia contain approximately eleven million inhabitants.

larger national groups constitute full Union Republics having equal rights and status with the other republics of the U.S.S.R.

The Uzbek Republic has the largest population (6,282,446), representing 50 per cent. of the population of all the Central Asiatic republics. Most of the people are settled farmers; but a large proportion—more than a third—live in towns. Not only does the Uzbek Republic produce 60 per cent. of the cotton of Central Asia, but within its boundaries is concentrated 80 per cent. of its industrial capacity. It is the most industrially developed of all the Soviet Asiatic republics.

The Turkmen Republic has the largest territory. Most of it is occupied by the Kara Kum Desert, so that the population is relatively small—1,263,985. The percentage of town dwellers is, however, greater than in any of the other republics. In 1939 it had risen to 50 per cent. The Kirghiz and Tadjik Republics each has a population of almost one and a half millions, the urban population amounting to slightly less than 25 per cent. in each. The Tadjik Republic includes the mountainous district now known as the Badakshan Autonomous Region.

CITIES AND COMMUNICATIONS

Cities

Amid the fields and gardens of the oases, surrounded by water channels, lined with poplar-trees, the villages consist of groups of brick houses which have largely replaced the old *yurta* and mud huts of bygone days.

The contrast between old and new is equally strong in the towns. From time immemorial the territory of Soviet Central Asia has been the scene of historic events—at one time within the ancient Persian Empire, at another under the domination of Alexander of Macedon; forming part of the Arab State founded in the seventh and eighth centuries, and in the fourteenth century the centre of Tamerlane's Empire. The towns possess many monuments of great antiquity, some brought to light only recently as a result of the work of Soviet archaeologists.

Tashkent, the largest city and the cultural and economic centre of Central Asia, with a population of 585,000, contains many mosques and old houses made from sun-baked bricks, or a light wooden frame covered over with mud. The streets are bright with the gaudy colours of the native dress, and are lined with the shops outside which the potters, carpet-weavers, and metal-workers display their wares. There is a grain bazaar where hundreds of camels, as well as motor trucks, may be seen loaded up with sacks. In the new quarter of the town there are flour-mills, leather, food, and fruit-preserving factories and textile mills surrounded by broad streets and modern flats and bungalows.

Samarkand (134,346) was once the capital of the ancient empire of Tamerlaine, which, at the end of the fourteenth century, included the State of Moscow within its domains. But like the other feudal states of Central Asia, it was eventually laid waste by nomadic tribes. There still remain, however, some fine examples of the architecture of the period—great mosques within the high mud walls which surround the old town, pierced by twelve gateways. The old streets are lined with low, flat-roofed houses, constructed of sun-dried bricks upon a frame of poplar, in striking contrast to the new cotton-ginning works and silk factories, modern theatres, office buildings, etc., and the new and imposing Institute of Tropical Medicine.

Ashkabad (126,580) is the terminus of the Central Asiatic Railway. It contains textile, glass, and meat-packing factories. The streets provide evidence of the impact of new ways of life upon the old. Camels make their leisurely way amid motor-cars, lorries, and bicycles. People in native costume mingle with others in European dress. Women jump on the buses on their way to work, for the old customs have changed, and no longer must the woman remain at home to do her master's bidding, or only venture out in the streets when she has veiled her face.

Bokhara (50,382) is a town with traditions and a history similar to those of Samarkand. Its seven miles of mud brick wall, now crumbled away in several places, surround narrow

streets and low houses, which face inward upon courtyards turning away from the streets, along which water-carriers carry their precious ware in large skins. There are local meat, bread, grain, vegetable, and pottery bazaars. Different streets are the homes of different handicrafts. One street, for example, is monopolized by the dyers, and is lined with steaming vats into which the craftsmen dip hanks of yarn, dyeing them with bright and beautiful colours. Near the railway junction, however, a new modern town has grown up within recent years.

The capitals of the Kirghiz and Tadjik Republics are Frunze (96,659) and Stalinabad (82,540) respectively. Stalinabad, a centre of the cotton industry, is a modern town, recently constructed to replace the ancient village of mud huts. Other towns of importance are Leninsk, formerly Chayui (54,739), Leninabad, with silk and leather factories, and brick works, and Andizhan, Namangan, Kokand, and Ferghana, centres of the cotton industry, situated in the Ferghana valley. Krasnovodsk (27,000) is the starting-point of the Trans-Caspian Railway, and is one of the main gateways to Central Asia. It is an important Caspian port.

Communications

The ancient towns of Central Asia were all situated in fertile, irrigated valley lands on the trade routes between the main centres of ancient civilization, in China, Egypt, India, and Mesopotamia. Great profits were made from trade with and between these countries. But with the opening up of the sea-way around Asia, the old caravan routes declined.

In 1917 Central Asia was connected to the world outside its boundaries by the railway from Chkalov to Tashkent. This line continues south from Tashkent to the Central Asiatic Railway, which runs to Krasnovodsk, on the Caspian shore. It forms an important artery along which agricultural and industrial products are transported to the Caspian Sea, and then by boat up the Volga into European Russia. The eastern end of the Central Asiatic Railway serves the Ferghana

valley and its cotton factories. Raw cotton yarn, cloth, and fruit are sent from this region and from Kokand, Andizhan, Namangan, Merv, and other 'oasis towns,' to European Russia.

From Bokhara branch lines, constructed since 1917, run to the Afghan frontier near Termez, and through the most populated part of Tadjikistan to Stalinabad.

The high mountains of Tadjikistan and Kirghizia make railway communication difficult, however, and this line, linking Stalinabad with the main railway system of Central Asia, has to make a detour of over 1000 miles to avoid the mountains which stand across the direct route.

Near Chimkent, in Kazakhstan, the Tashkent-Chkalov Railway is joined by the new Turksib main line, which has important branch lines to the Pre-Balkhash copper refineries to the north, and Frunze, in the Chu valley, to the east.

River transport is of local importance. At Chayui the Central Asiatic Railway crosses the Amu Darya by means of one of the longest bridges in the U.S.S.R. Its length is almost one mile. River steamers ply up and down the river between the delta and this town.

In the deserts camels are still used for transport, outnumbering horses in all the arid regions. The Khorezm oasis is an important centre at which several caravan routes converge. Many of the tracks are difficult for wheeled vehicles. Where irrigation is practised in the 'oases' there are sometimes no bridges across the water-channels, and only vehicles with large wheels can cross them. Nevertheless, many of the desert tracks are now used by motor traffic. Several new highways have been constructed—from Osh to Khorog (469 miles), from Osh to Frunze, from Osh to Stalinabad, and a road running for 375 miles between Stalinabad and Termez. The road from Osh to Khorog runs through the difficult mountainous country of Badakhshan, in the Pamirs. The Stalinabad-Khorog road crosses the mountains by means of a pass 11,000 feet above sea-level.¹

¹ Before the construction of the new roads the mountainous Tadjik Republic was largely isolated. In many parts wheeled vehicles had never been seen. There are now more than 4000 miles of highways, making possible the exploitation of the great mineral wealth of the mountains.

Finally, mention must be made of the regular air services which now operate in Central Asia. In parts of Turkmenistan the aeroplane was the first mechanical vehicle which the native peoples had seen. To-day air-lines radiate in all directions from Samarkand, Leninabad, and Tashkent. One of the longest is that which operates between Tashkent and Moscow. Another interesting feature of the new methods of communication which have been developed is the use of the radio-telephone for long-distance calls. There is a regular service between Moscow and Tashkent.

Central Asia is connected by economic ties with Western Siberia (by means of the exchange of timber and grain for cotton), with China by means of at least one motor-road through Chinese Turkestan, and with European Russia by the export of cotton and other agricultural products via the Caspian and Volga, and along the railway line to Orenburg. Like Western Siberia, it is rapidly developing both its agriculture and its own centres of industry, and to this extent is fast becoming an important economic unit, forming a part of the planned economy of the entire Soviet Union.

The economic orientation of Sinkiang (Chinese Turkestan) towards Soviet Central Asia is particularly interesting. The new roads into Sinkiang from the Turksib Railway (see pp. 49 and 387) bring the populated parts of the country much closer to the U.S.S.R. than to China proper.

Along these roads wool, tea, tungsten, and tung oil are exported from Sinkiang to the Soviet Union, which in return sends supplies of arms and military and technical equipment to China.

BIBLIOGRAPHY

Russian

- V. V. BARTHOLD and L. Š. BERG, etc.: *Turkmenia* (Academy of Sciences of the U.S.S.R., Leningrad, 1929).

Articles published in "Nasha Strana" (Moscow)

- B. PETRUSHEVSKI: "Shez-Kasian," in No. 1, 1939.

- A. SHEKOV: "In the Kazakh Steppe," in No. 1, 1939.

- N. YANITSKI: "Kazakhstan," in No. 1, 1939.

- A. ABALIS: "Samarkand," in No. 3, 1939.

- A. DOSKACH: "The Delta of the Amu Darya," in No. 3, 1939.
Z. MURZAYEV and A. KONOPLYANTEV: "Half a Year in the Kara Kum," in No. 3, 1939.
I. VLADIMIROV: "In Uzbekistan," in No. 3, 1939.
I. SERGEYEV: "Land of White Gold," in No. 3, 1939.
M. GREEN: "At the Great Ferghana Canal," in Nos. 10, 11, 1939.
V. ZENKOVICH: "From Manishlaka to the South," in No. 7, 1940.
B. PETRUSHEVSKI: "Artesian Wells" (Kazakhstan), in No. 8, 1940.

Materials of the Commission for the Investigation of the Industrial Strength of the U.S.S.R.: Karabougaz and its Industrial Significance (Moscow, 1930).

English

- E. S. BATES: *Soviet Asia* (Cape, 1942). (Contains good bibliography.)
P. GOUDKOV: "Economic Geography of the Coal Resources of Asiatic Russia," in *Geographical Review*, vol. xiii (1923), pp. 283-293.
E. K. MAILLART: *Turkestan Solo* (Heinemann, 1938).
E. MANNIN: *South to Samarkand* (Jarrolds, 1936).
L. G. MICHAEL: "Cotton-growing in the Soviet Union," in *Foreign Agriculture*, No. 2, 1938 (U.S. Dept. of Agriculture, Washington, D.C.).
M. ROMM: *Ascent of Mount Stalin* (Lawrence and Wishart, 1936).
A. J. STEIGER and R. A. DAVIES: *Soviet Asia* (Gollancz, 1943).

French

- A. E. VOEIKOV: *Le Turkestan Russe* (1914).

German

- A. SCHULTZ: *Die Natürlichen Landschaften von Russisch Turkestan* (Hamburg, 1920). *Sibirien: Eine Landeskunde* (Breslau, 1923).

The Urals

THE Ural Mountains, together with the land close to them, not only occupy a central position within the territory of the U.S.S.R., but also a most important position in the economy of the whole country.

This region is in many respects transitional in character between north and south, east and west. In the past it was regarded as the frontier between civilized Europe and backward Asia, almost an outpost of European Russia. Physically, it has been wrongly regarded as the frontier between Asia and Europe, although it has never in any sense constituted a barrier to communications; and climatically there is little difference between its eastern and western slopes. The ancient Finnish tribes crossed the Urals on their way to Northern Europe. The early Russian explorers and traders found no difficulty in making their way across the Urals into Siberia.

Along the ridges and slopes of the Urals the cold north pushes its icy fingers deep into Russia. Severe frosts and deep snows are characteristic of the Northern and Central Urals, which are covered with coniferous forests. In the south the transition to the Asiatic lands is marked by drought, hot summers, and steppe vegetation.

The northern part of the region has already been described in Chapter VIII. Like all the lands of the Far North, it is sparsely peopled, the inhabitants being occupied mainly with hunting and reindeer-breeding, or with lumbering and forestry.

The centre and south together comprise a region very similar to those regions of Southern Siberia described in Chapter XII—regions which embrace coniferous forest, wooded steppe, and steppe lands, lying astride the great east-west line of communication served by the tributaries of the larger rivers and by the Trans-Siberian Railway.

Just as the Novosibirsk region is closely linked, economically

and by virtue of its physical position, with Eastern Siberia, Central Asia, and the Urals, so are the Urals linked with the Novosibirsk region by means of the new Ural-Kuznetsk industrial "Combine" and also with Central Asia, and European Russia, as well as lying close to that great transport artery, the Volga.

In fact, the Urals, once the symbol of the transition from civilization to more backward ways of life, have become the symbol of a powerful wave of industrialization which is sweeping into Siberia and Central Asia.

The Urals now mark the beginning of vast new industrial areas which include giant industrial undertakings and modern cities.

PHYSICAL CHARACTERISTICS

The general structure of the Urals has been described in Chapter I. The mountain system consists of a number of parallel ridges, divided by depressions and valleys, much denuded and worn down by the action of the weather, rivers, sea, and ice.

Thus there is nothing very grand or majestic about the Urals. From the top of the ridges wide views can be obtained of forested hills, with smooth rounded contours and wide, deep, gently sloping valleys. Like gigantic dark green waves the country extends on all sides, broken only by an occasional mountain top, bluish in colour, peeping out above the dark forest mass. Owing to the severe winters and poor stony soil, the forest gives way to vegetation of the Tundra type at a height of about 2500 feet.

The northern ranges (four parallel ridges) are not very high or very wide. The central section of the Urals bears the remains of five ranges, which, however, have been almost completely worn away and broken into separate blocks, so that between Sverdlovsk and Chelyabinsk communications across the Urals are particularly easy, and the landscape can hardly be described as mountainous (Fig. 44). The south is quite different. The ranges are longer and higher than in the north, and are separated by deep valleys. Limestone outcrops

and karst formations are common. The Mugodzhar Mountains form the most southerly and very low extension of the Urals.

The Pre-Ural region, lying to the west of the main range, consists of a hilly plain, the surface worn into wide rolling valleys; the general elevation of the land rises very gradually towards the east. Towards the south the Obshchy Syrt consists of a system of ancient folds, so much destroyed or denuded that the folding is noticeable only where the surface is deeply dissected by valleys (Fig. 45).

The eastern slopes of the Urals are relatively steep, with a much more truly mountainous type of landscape, overlooking the Trans-Ural region, a very level lowland, representing the edge of the West Siberian Lowland, once the floor of a sea which washed the mountain slopes. Close to the mountains there are numerous lakes, deep, often with steep banks, and containing fresh water. Farther south, in the steppe, they are shallow and saline.

The Urals form the divide between those rivers which drain towards the Pechořa and the Volga and those which drain into the Ob. The latter, falling rapidly from the relatively steep slopes of the mountains, are of use for navigation only when they reach the plain. The former are much deeper and are usually broad and slow-flowing. The Kama, a large, deep, and wide tributary of the Volga, is the most important. Large boats use this river as far upstream as Perm. Above Perm both the Kama and its tributary the Chusovaya are used by smaller vessels. Farther south is the Belaya, the only other tributary of any importance.

CLIMATE AND VEGETATION

The climate of the Urals region is the most continental of all European Russia. The winter is typically Siberian in character, with severe frosts, and lasting for five or six months. But except in the open steppe country of the south there are no strong winds, so that the cold is tolerable from the human point of view.

The summer is very warm, even in the north. July temperatures increase from 64° F. in the north to 72° F. in the

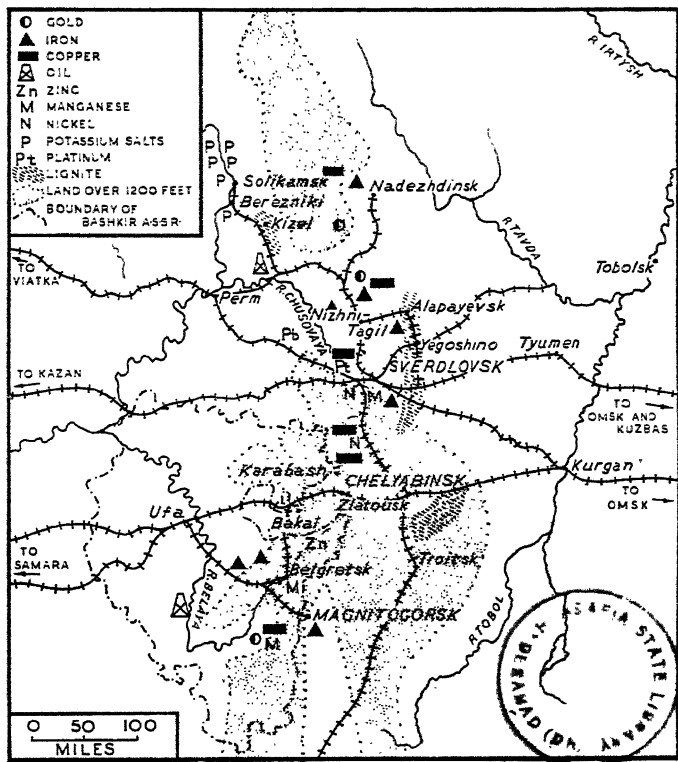


FIG. 44. THE URALS REGION

south, where hot south-easterly winds, reminiscent of Central Asia, are experienced.

Precipitation is generally light, especially in the south-east. The distinction between north and south is reflected in the vegetation, changing southward from coniferous forest to

wooded steppe and open black earth steppe, lands. Along the mountain ridges the forests penetrate into the steppe in long tongues, while in the forested lands there are the usual valley meadows. In the Central Urals there is a great deal of open birch and aspen woodland, while towards the south-west, in the pre-Urals district, there is the eastern extension of deciduous forest zone of Central Europe.

In the open steppe country of the southern Urals, there is an abundance of small lakes, and 'solonchak' formations, with occasional birch-woods. Towards the east the transition into Siberia is marked by an increase in the 'solonchak'¹ formations and in the number of salt lakes.

MINERAL WEALTH

The folding of the Urals, which took place during the Hercynian period, was accompanied by considerable faulting and fracturing, especially in the eastern part of the range. Ancient rock formations were brought up close to the surface, and the prolonged denudation which followed has exposed a great variety of valuable mineral deposits, especially in the southern and central parts. There is an amazing variety of these deposits, which probably constitute the greatest concentration of mineral wealth in the world. There is an old saying, common in the schools and universities of Russia, "If you are asked in an examination where some useful mineral is found, point to the Urals. Everything is found there."

Deposits of iron ore constitute the most important mineral resources. There are entire mountains of high-grade magnetite ore—Mount Blagodat, Mount Visokaya, and the Magnetnaya Mountain—ore which has an iron content of 60 per cent. The Magnetnaya Mountain deposits alone amount to 450,000,000 tons. To the north-west of Magnetnaya Mountain are the Zigazin deposits, in the Bashkir Republic, with ore reserves of 150,000,000 tons; to the north

¹ See p. 115.

the extremely pure high-grade ore of the Bakal mines.¹ Titanomagnetite ore is found here, together with deposits of copper and vanadium. Other minerals, the distribution of which is shown in Fig. 44, are manganese (2,600,000 tons), nickel, wolfram and copper (found together with zinc), lead, silver and platinum, bauxite, rock salt, potassium salts, limestone, dolomite, quartzite, and precious stones such as amethyst, topaz, and emerald. (See also pp. 241, 244.)

On the western slopes of the Urals coal, which is used in conjunction with coal from Karaganda (Kazakhstan) for coking, is found, and is mined at Kizel, north-east of Perm. Brown coal is mined at Yegorshino, east of Sverdlovsk, and at Chelyabinsk,² for use locally as a fuel. It should be noted, however, that the coal deposits are small and the reserves constitute only about 6 per cent. of those of the Don basin. Oil is found in the north at Chusovsk, near Perm, and in the south at Ishimbayev, in the Bashkir Republic.

Partly owing to the low precipitation of the region, and partly owing to the low elevation of the mountains and the absence of glaciers and large snowfields, there are no great reserves of water-power, and, indeed, while possessing great resources of metal, the Urals is deficient in fuel resources. This deficiency is to some extent being overcome by the development of new oilfields, known in the Soviet Union as the "Second Baku." Oil is known to occur in the carboniferous strata throughout a large area between the western slopes of the Urals and the Volga (see Fig. 44), while a large proportion of the production of the Emba oil-wells is also sent to the Urals.

INDUSTRY³

The industries of the Urals have been built up primarily upon the basis of the excellent iron ore which is mined in

¹ Note also the Tagil-Kushvinsk iron deposits, and the valuable chrome-nickel-iron ores of the Khalilov area. There are large bauxite deposits at Nadezhdinsk, Alapayevsk, and Kamensk, and copper and nickel to the south of Sverdlovsk.

² The production in 1940 was 5,000,000 tons. Only the Kizel mines yield good coking coal.

³ See also the section on industry in Chapter VIII.

the region. As early as the sixteenth century, when the army of the expanding Moscow State needed guns and ammunition, and Tula became Russia's first armoury, the need for more supplies of iron led the Tsar to grant to the aristocracy rights to exploit the Urals.

The landowners were empowered to take with them their serfs, who thus became forced labourers. From year to year production of iron increased, until in 1827 the annual output of pig-iron was 155,400 tons. Smelting was carried on by means of charcoal, and as this is a fragile material, easily crushed under the weight of large quantities of ore, the size of the furnaces was severely limited. The rivers were used for the purpose of floating timber from the forests, and as sources of power. Each little industrial undertaking had its mill-pond and water-wheel, and an enormous amount of labour had to be employed in the mines in hauling the ore to the furnaces (horses were used) and in felling trees, sawing timber, and making charcoal. But serf-labour was plentiful and cheap, and it was not until the abolition of serfdom and the introduction of coke-smelting that the Urals lost its position as Russia's chief producer of iron. When there was no longer any forced labour, and when in the Don basin foreign companies had installed larger and more modern furnaces, making use of the excellent coking coal which lay close by, the industries of the Urals declined. Apart from the lack of labour, there were no supplies of coking coal.

After 1917 the Soviet Government decided to introduce a bold plan—the exchange of iron ore from the Urals for the coking coal of the Kuznetsk basin, some 1200 miles to the east, and the utilization of coal from Karaganda, 600 miles to the south-east. Thus the Urals became linked as part of a gigantic industrial organization with both Siberia and Asia.

Coal from Kizel, on the western slopes of the Urals, combined with Karaganda coal, is also used for the making of coke.

The power reserves of the region have been supplemented by the development of local oil-wells,¹ in conjunction with the use of oil brought by pipeline from the Emba oilfields,

¹ The Ishimbayev wells produced one million tons of petroleum in 1936.

the construction of a hydro-electric station near Perm, and electric-power stations burning peat or coal at Perm, Berezniki, Sverdlovsk, Magnitogorsk, and Orsk, and at Kizil and Chelyabinsk, where local coal is used. All these stations are linked by high-voltage transmission cables, forming a power-net which serves the entire Ural industrial region.

Magnitogorsk is to-day a modern city of 200,000 people, which rose within the short space of three or four years near the site of a small village by the banks of the Ural river, at the foot of the Magnetrnaya Mountain. The river Ural had to be dammed in order to create a water supply, and a branch line was constructed to connect the town with the main railway line to the north. At Magnetrnaya Mountain modern mechanized mines were constructed.¹ Giant blast furnaces and steel-mills were erected. These furnaces now produce more than 2,000,000 tons of pig-iron each year and nearly 2,000,000 tons of steel, equal to one-half of the output of all the furnaces and mills of Russia prior to 1917. The steel mills supply large machine-building and machine-tool works both at Magnitogorsk and in other towns of the Urals. Using the by-products of the coking process, a great chemical industry has been established. The entire Magnitogorsk Combine covers an area of 27 square miles in the valley of the river Ural.

The lonely open steppe has come to life, and where the nomads of yesterday pastured their flocks trains loaded with coal and iron ore journey to and from Kuznetsk, and great blast furnaces rise in the midst of rolling open country.

Chelyabinsk, long noted for its flour-mills, to-day possesses a big regional electric-power station, which utilizes local brown coal, and an enormous tractor factory with an annual output of more than 40,000 heavy Diesel tractors. Zlatoust (one of the older industrial towns), Bakal, and Beloretsk, produce high-quality steels and alloys, from the titanomagnetite ores of the Bakal mines, and the iron and manganese deposits near Beloretsk. Copper-refining is carried on at Karabash, on the basis of local supplies of ore.

¹ The annual output of iron ore is 6,500,000 tons.

To the south lies the Orsk-Khalilov industrial district, with oil refineries connected by pipeline to the Emba oilfields, iron and steel, nickel, and machine-building works, and a large meat-processing and packing centre. Chromite, nickel, and magnetite iron are mined. In association with the iron is a combination of gold and copper deposit. The gold is extracted, and the copper refined at Orsk. Sulphur compounds found in the copper ore are used in the chemical industry, for the manufacture of sulphuric acid. Iron and steel works at Orsk supply materials to a large new locomotive-building plant.¹

The industrial centres described above together form an industrial region situated around the flanks of the Southern Urals. Between this region and the second group of industrial towns farther north—that is, between Chelyabinsk and Sverdlovsk—lies the low central section of the mountain system. This is the most denuded part of the Urals, and it provides an easy passage across them, followed by the two trunk lines from European Russia to Siberia, passing through Chelyabinsk and Sverdlovsk respectively.

Just as the industries of the Southern Urals depend largely upon the immense resources of iron ore found in the Magnetnaya Mountain, so those of the Central Urals depend upon the iron ore of Mount Blagodatskiy and Mount Visokaya. Kuznetsk and local Yegorshino and Kizel coal, oil from wells situated to the north-east of Perm (Fig. 44), and peat are used in factories and power stations.

Sverdlovsk supplies practically all the industries of the Urals and the entire U.S.S.R. with machinery and machine-tools, in addition to furnace equipment. Copper is mined and refined at Revda, near Sverdlovsk, and at Kirovograd and Krasnouralsk to the north. At Nizhny Tagil are the largest wagon-building works in the world. One million tons of pig-iron is smelted annually. High-quality steels and alloys are produced, and non-ferrous metallurgy is carried on (including the production of zinc). The manufacture of

¹ Other industries are the mining of lignite, to the south-east of Orsk, salt at Iletsk, and phosphorites to the south and south-west of Chkalov.

machinery for heavy industry and the production of paints and varnishes are also among the industries of the town.

Prior to 1917 the only source of bauxite exploited in Russia was at Tikhvin, to the east of Leningrad. But new deposits at Nadezhdinsk, Alapayevsk, and Kamensk are now utilized, and the latter town is the centre of the Urals aluminium industry. Asbestos too is found in the Urals. The deposits are worked in huge quarries near the new town of Asbest, and occur in workable bodies from 20 to 200 metres thick. About 120,000 tons are produced each year. The output of platinum has increased to such an extent that it now occupies a position of world importance. It is mined to the north of Nizhne Tagil. Another valuable metal which is mined is gold. The Beresovsk gold-mine, situated to the north-east of Sverdlovsk and discovered in 1745, was the basis of the first Russian gold industry.

To the north-west of Sverdlovsk are the industrial centres of the Perm region. The salt and potassium deposits at Solikamsk and phosphates to the north provide the basis for the chemical industry at Berezniki,¹ while at Perm the most important industries are concerned with non-ferrous metallurgy, the manufacture of phosphatic fertilizers, and the building of ships for river traffic. Coal is mined at Kizel, and oil at Chusova.

The forest resources of the Urals, which in the past provided charcoal for the iron industry, are now utilized by the paper- and cellulose-mills at Krasnovishersk and the large paper-mills of Krasnokamsk, on the Kama river near Perm (completed in 1936). The rivers are used for the transport of timber.

Thus within the short space of twenty years the Urals region has become one of the foremost industrial areas of the world, comparable only with the largest industrial districts of Europe or America, supplying the U.S.S.R. with heavy industrial equipment, machinery, tractors, locomotives, iron and steel, non-ferrous metals, oil, and chemical fertilizers, and drawing a large proportion of its raw materials from Western Siberia and Kazakhstan.

¹ Here salt is obtained from brine pumped from below the surface.

AGRICULTURE

Agriculture is developed to the greatest extent in the southern part of the region—in the wooded steppe and steppe zones. North of a line extending roughly from Perm to Tyumen, amid the forests, with their poor podsolized soils, agriculture is limited to the growth of flax, and the rearing of milk cattle upon the valley meadows, together with the small-scale cultivation of crops for local use. Less than 5 per cent. of the land is arable. Near the new towns and mining settlements, vegetables and milk are produced for urban consumption.

The chief areas of arable land lie to the south of this line, in the steppe zone, which produces a surplus of wheat in the south and rye and oats in the north. The greatest amount of wheat is raised in the Trans-Urals region. In the Bashkir Republic hemp and sunflower are important crops.

In the Orenburg¹ district the climate becomes drier, with a very slight fall of snow to protect the ground from frosts in winter. Spring wheat is important. Large areas of the drier steppe country are devoted to the rearing of cattle, sheep, and horses. The profusion of flowering plants in the meadows and grassland provides the basis for bee-keeping. This region is one of the most important in the Soviet Union for the production of honey.

The chemical fertilizer industries of the Urals, together with the production of tractors and agricultural machinery, is of the greatest importance for the state and collective farms, the produce of which is sent by rail and river to all parts of the Soviet Union, as well as supplying the industrial regions of the Urals with food.

Industry and Agriculture in the Bashkir Autonomous Republic

On the western slopes of the Urals, between the steppe and forest zones of the Pre-Urals region, lies the Bashkir Autonomous Republic, before 1917 a part of Russia devoted to agriculture, but now a part of the great industrial complex,

¹ Orenburg is now known as Chkalov.

the core of which is situated around Chelyabinsk, Sverdlovsk, and Magnitogorsk.

The Beloretsk metallurgical and engineering centre has been mentioned above. Manganese and chrome are found to the north and south, and iron near Zigazinsk, and are used in the production of steel of the highest quality. Copper and gold are mined near Baimak.

The oil industry of Bashkiria is rapidly assuming a position of first-rate importance for the entire Urals industrial region. Oil from Syzran on the Volga and from Ishimbayev is transmitted by pipeline to the cracking plant at Ufa. Containing 25 to 30 per cent. of volatile fractions, the former is particularly valuable for the production of aviation spirit.

There are oil-wells at Tuimaza, west of Ufa, and near Ishimbayev, where high-quality benzine is manufactured.¹

In addition to being a centre of the oil industry Ufa possesses wagon-building works, shipyards, and a modern plant for the manufacture of motor engines. Coal from Karaganda is used by these industries.

Cattle-rearing is the most important sector of agriculture in this republic. The Bashkirian dairy herds provide the urban population of the Urals with milk and butter. There is a large dried-milk factory at Meleuzogorsky.

The river Belaya divides the land into two sharply contrasted regions. The lands on the right bank are hilly and wooded. From the left bank open plains and wooded steppe lands, possessing fertile black soils, stretch away to the horizon. But drought makes the cultivation of the soil a difficult matter, and has to be combated by the adoption of extensive dry-farming methods. Such methods have had remarkable results, reflected in the great increase of arable land.

Industry and Agriculture in the Udmurt Autonomous Republic

This small republic lies to the north-west of the Bashkir Republic, in the forested country of the Pre-Urals.

¹ The Ishimbayev oilfields produced one million tons of petroleum in 1936.

With the growth of industry the population has increased rapidly since 1920. The output of steel has increased more than tenfold. Ishevsk is the main centre of the industry, and machines, lathes, precision instruments, and small arms and motor-cycles are produced.¹ The timber resources are utilized by the wood-working industries at Mozhga.

Flax, grown mainly in the north, is the most important product of agriculture, and supplies a large number of linen factories, including a large modern factory at Glazov. Potatoes form the most important crop in the south, and the rearing of cattle on the meadowlands is also of importance. About $2\frac{1}{2}$ million acres are now under crops.

COMMUNICATIONS

Very few of the rivers are useful for navigation. The Kama, and to a less extent the Belaya and Chusovoya, are the most important, and they link the region with the Volga.

Three main railway-lines cross the region from west to east: from Leningrad and from Moscow through Sverdlovsk, and from Moscow through Chelyabinsk. The lines from Sverdlovsk and Chelyabinsk converge at Omsk, to form the main-line of the Trans-Siberian Railway. In addition to these trunk lines there is a relatively dense network of north-south communications. Railway-lines run from Chelyabinsk via Troitsk to Orsk and Orenburg, with a branch-line to Magnitogorsk and another to Kustanai. From Chelyabinsk the line continues north to Sverdlovsk and Nadezhdinsk. From Orenburg a main-line links the region with the republics of Central Asia. A new line is to branch off from this line at Akmolinsk and run to Karaganda, in order to provide a direct route along which the coal of Kazakhstan may be sent to the Urals. Reference to Fig. 44 will make it clear that all the industrial centres of the Urals are now served by

¹ Note that the products of the Izhevsk engineering industries are those requiring relatively small amounts of high-grade metal, since the iron ore has to be transported to the steel-mills from the mines of the Urals. The river Kama is used for most of the journey.

railways, many of which are electrified and several of which have been constructed within the last ten years.

The Bashkir Republic was in the past particularly poorly served by railways. The Belaya river was the most important transport artery for this region. But the imperative need to provide Magnitogorsk with a good system of communications has led to the construction of a number of railway-lines, some of which pass through the republic. Among those lines which have been planned or have already been completed mention must be made of the railway from Ufa to Magnitogorsk, via Beloretsk, with a branch line to the Komarovo-Zigazin mining district, the lines from Ufa to Ishimbayev and Orenburg, and Ufa to Kazan. It is obvious that Ufa, the administrative centre of the Bashkir Republic, is destined to become a railway-junction of great significance, the more so since the town is situated on the navigable Belaya river, which is of considerable use as a waterway leading to the Volga.

POPULATION AND TOWNS

The first settlers in the Urals were the ancient Finnish and Turkic peoples. To-day they form about 25 per cent. of the total population. The Bashkirs, the remnants of the original Turkic group, number about one million. They form only a third of the total inhabitants of the Bashkir Republic. The rest are Russians (44·4 per cent.) and Tartars (17·3 per cent.), Ukrainians, Byelorussians, Chuvash, and Marii peoples.¹ About 84 per cent. of the population is engaged in agriculture.

The Finnish group, known as the Permyakis, and related to their neighbours of the Komi Republic, live mostly near the north-western border of the Urals region.

The total population of the Urals region is about 11,500,000. The Bashkir A.S.S.R. supports over 3,000,000 people, the Udmurt A.S.S.R. and Chuvash A.S.S.R. a little more than 1,000,000 each, and the Marii A.S.S.R. 579,000.

The density of the population is greatest in the Pre-Urals

¹ The Chuvash and Marii peoples are found mainly in the Chuvash and Marii Autonomous Republics.

and Trans-Urals, and least in the forested north and the dry south. In the autonomous republics mentioned above the majority of the population is rural. In the industrial areas there is a high urban concentration, which reaches 45 per cent. in the Sverdlovsk and 37 per cent. in the Chelyabinsk districts. Rapid industrial expansion has resulted in the quick growth of the towns. Sverdlovsk, with 425,544 inhabitants, is four times larger than it was in 1917. It is situated at the junction of seven railway-lines and is an important airport. Magnitogorsk was a village of some 2000 inhabitants not many years ago. To-day it has a population of 146,000. Chelyabinsk, situated at the intersection of important railway routes, has a population of almost 300,000. Perm has 255,000 inhabitants.

Other towns which have shown remarkably rapid growth are Ufa (245,863), Izhevsk, in the Udmurt Republic (175,740), Zlatoust (99,272), Ishim (145,870), Berezniki (63,575), while there are a number of industrial centres with populations of 50,000 or more.

The growth of industry and population in the Urals is of the greatest strategic importance to the U.S.S.R., since it has provided an "industrial base" well away from the frontiers and hence not liable to attack in time of war.

BIBLIOGRAPHY

Russian

Articles published in "Nasha Strana" (Moscow)

B. RYABININ: "The Kama," in No. 3, 1941.

V. SULIN: "The Second Baku," in No. 3, 1939.

English

R. A. DAVIES and A. J. STEIGER: *Soviet Asia* (Gollancz, 1943).

See also the bibliographies at pp. 66 and 253.

The Povolzhye (the Lands along the Volga)

THE lands along the Volga and its larger tributaries form an enormous region which extends for 900 miles from north to south, and although these lands include parts of the great coniferous forest zone, the wooded steppe zone, and the steppe and dry steppe zones, the Volga unites the entire area into a single economic unit.

In its upper course, near the confluence of the Oka, at Gorki, the Volga is from one-half to one and a quarter miles wide, and is navigable for river steamers. The width of the valley exceeds 12 miles. Below the confluence of the Kama the Volga is about 2 miles in width, and this increases during the spring floods to between 10 and 20 miles. In the middle and lower course there are numerous islands, shallows, and sandbanks, which impede navigation, especially at the end of the summer (see p. 62). The lower Volga passes through an arid region between low banks, and flows through an enormous delta before reaching the Caspian Sea. The southern edge of the delta consists of an amazing combination of islands, islets, lakes, gulfs, and innumerable streams. Enormous quantities of mud are deposited on the sea-bed around the delta itself, creating shallows which make navigation difficult. These shallows and the difficult conditions for navigation in the delta prevent ships of the Caspian mercantile fleet sailing up the Volga. Cargoes have to be transferred to river vessels at Astrakhan.

From ancient times this mighty river has served as a transport artery between Central Asia, the Caspian, and the Baltic. The early portages between the rivers flowing into the Baltic and the upper Volga were replaced later by canals.

For many centuries the Asiatic nomads came to the Volga to trade, and around the trading points strong feudal states

were established, such as the Khanate of Kazan. These were eventually suppressed by the expanding Moscow State.

The lands lying near to the Volga possess no great mineral resources, but since the time when the river came to be used regularly by the Russians wheat, salt, oil, coal, and timber have passed up and down, supplying the lands close to the river with commodities in which they are deficient. The Volga boatmen, renowned in song, were the men who spent their lives toiling on the large wooden ships and barges which carried these commodities and supplied the towns with raw materials for their industries, and which brought food—particularly bread and salt, the traditional Russian emblems of hospitality—to their populations.

Thus this great Russian transport artery became an axis around which economic regions have grown up. Along the river came raw materials, while manufactured goods and the products of agriculture were exported in the same way.

The construction of railways further increased the importance of the waterways. It enabled cargoes to be transhipped at various points for convenient carriage by rail to those parts of Russia not directly served by the Volga. Ten main-lines come down to the river from the west, and five of them cross it and continue to the east or south-east. The chief towns are situated at the junctions between river and railways. But it must be remembered that they were in most cases well established before the building of the railways, which increased their importance as trading and commercial centres, but did not create them.

Five of the main-lines come to the lower Volga, and of these, three converge upon the city of Stalingrad.

In addition to these west-east lines there are others (Fig. 45) which run in a north-south direction. These are of particular importance in winter, when the Volga is frozen and navigation is brought to a standstill. During the summer, however, it is estimated that the Volga carries a load which could only be carried by five main railway-lines.

In addition to being a main route between north and south the Volga also formed a natural frontier to the early expansion

of the Moscow State. Long after Russia had secured control over the territory lying to the east of the river these dry lands, which extend into the deserts of Kazakhstan and Central Asia, remained uncolonized, because they were unattractive and unproductive. Consequently they did not come to any large extent under the jurisdiction of feudal landowners, and many peasants sought refuge there from serfdom. At various periods in Russian history peasant bands have joined together in revolt against the feudal lords of the Volga, retreating in case of defeat to the 'free' lands on the east bank.

The marked differentiation between the wetter western lands and the more arid eastern lands remains to this day, and the lands on the left bank are still sparsely peopled.

Both the character of the river and the nature of the relief, climate, soils, and vegetation change from north to south, so that the Povolzhye fall naturally into three divisions: (1) the northern forest region; (2) the central wooded steppe region; (3) a southern region of steppe and dry steppe.

THE NORTHERN FOREST REGION

The northern forest zone is drained by the upper Volga and its tributaries, the Sura, Sviyaga, Kama, Vyatka, and Vetluga. The watershed between the two latter rivers and those draining into Arctic waters—the divide between the Volga and Arctic drainage basins—is formed by the low hills which also divide the Gorki and Kirov administrative regions from the Northern Region.

The remainder of the northern forest region consists of a slightly hilly plain, flattest in the west, and covered by glacial and fluvio-glacial deposits of sands and clays, with considerable marsh and peat-bog formations.

Winter lasts for five months as compared with three months in the lands around the lower Volga. Westerly and north-westerly winds prevail, and precipitation is relatively high. To the north of the Volga and the Kama poor podsol soils and coniferous forests predominate, changing to mixed

deciduous and coniferous trees towards the south, where there are generally clay soils, with occasional patches of black earth.

The economy of this region is determined primarily by four main factors: (1) the extensive forests, the basis of the lumber industry, which supplies timber to many parts of the Soviet Union, much of it being shipped down the Volga to the treeless steppe land; (2) shortage of grain, due to the limitation of cultivation by the cool, damp climatic conditions and poor soils; (3) the prevalence of handicraft industries which were developed in the past as a source of income which could supplement the poor returns of agriculture; (4) the rôle of the Volga-Kama waterway and valley as a route connecting the Moscow and Urals industrial regions, followed by railway-lines from Europe to Siberia.

The numerous saw-mills of the region cater for the home rather than the foreign market, supplying the Moscow district, the steppe zone, the Don basin, and even Baku and Krasnovodsk, on the shores of the Caspian. A large proportion of the timber is sent down the river in a 'raw' state, only about half of the total production being used for paper manufacturing, the production of matches, and the chemical industry. The Balakhna paper-mills, near Gorki,¹ are some of the largest in the world. There are large cellulose, paper, and wood-working plants at the mouth of the Vetluga river, in the Marii A.S.S.R., and at Shumalin, in the Chuvash A.S.S.R. The oak forests in the south-west of the latter republic provide raw material for the furniture, parquet, and veneer industry.

In agriculture the colder and damper northern part of the region specializes in the production of potatoes and flax and the rearing of dairy cattle, while in the south pig-breeding and poultry-farming are important occupations. Both the area and the yield per acre of flax and sown grass have been increased. Rye and oats occupy the greater part of the land

¹ North of Gorki, between the Vetluga and Unzha basins, 65 per cent. of the timber in the forests is useless for constructional purposes. It is therefore used only in the paper and cellulose industries.

sown to grain crops, although more wheat is now grown than formerly.

There are many industries which are dependent upon the products of agriculture—tanning and boot and shoe manufacturing at Bogorodsk, and the flax and hemp industry, which supplies the regions adjacent to the Volga with ropes and fishing-nets. As there are no large supplies of minerals, and in Tsarist times the region became over-populated, the handicraft industries developed and have for long employed large numbers of people. Of these the most important are wood-work and metal-work artels (near Pavlovo) and the preparing and manufacturing of sheepskins and sheepskin coats, etc., at Kirov (formerly Vyatka). Within recent years much use has been made of local fuels such as peat and wood, together with oil brought from Baku and coal from the mines of the Don basin. This has brought about the expansion of industry on a much larger scale than was possible hitherto. Regional electric-power stations working on peat have been built at Gorki and Balakhna. Peat and phosphate deposits are being utilized in the chemical industry.

Heavy industry (metallurgy and the construction of machinery and vehicles for transport) has expanded to such an extent that the region around Gorki is now one of the U.S.S.R.'s leading industrial areas.

Ship-building and ship-repairing have been carried on near the Volga for nearly a hundred years. At Sormovo this industry has been developed to include the construction of engines, diesel motors, motor-cars and lorries, self-loading wagons, tram-cars, boilers, and boring machinery, while river steamers, tugs, and barges for the Volga and sea-going vessels for the Caspian are built here.

The Gorki automobile works—the largest in Europe—employs over 15,000 workers and produces cars and lorries. Lathes, diesel motors, aero-engines, and river vessels are also produced at Gorki. Near by, at Balakhna, paper is manufactured from timber floated down the Volga and its tributaries from the northern forests.

At Pavlovo large numbers of men have brought their

traditional skill in fine handicraft work to the new tool-manufacturing, tractor, and automobile works.

For all these industries the greater part of the iron employed has to be brought from other parts of the Soviet Union. But an ever-increasing proportion of local ores is being used since the opening of mines near Murom, on the river Oka, and others to the north of Omutninsk.

The largest deposits of phosphates in the whole of the Soviet Union are situated on the Vyatka-Kama watershed. They supply the chemical works at Dzerzhinski, near Gorki.

The majority of the industrial undertakings of this region are in towns which are grouped together and form an industrial area with Gorki as the centre.

Communications

The position of Gorki at a point where the main line of communication from the Moscow State to Siberia crossed the great highway of the Volga was appreciated in the thirteenth century, when the original town of Nizhni-Novgorod was founded. The town was situated at the place where the large vessels which plied up and down the Volga were unloaded, and their cargoes transhipped to smaller boats which made the journey up the river Oka to Moscow, and later by the canals which gave access to Leningrad and Archangel.

Nizhni-Novgorod became a most important trading centre, the main junction between the Moscow State and the East—Persia, and Central Asia (via the Volga and the Caspian)—the Urals and Siberia. Tea was brought from China across Siberia and was but one item of commerce which made the Nizhni-Novgorod fair of world-wide importance.

With the advent of the railways, lines were laid down from Moscow and Leningrad through Vyatka and Gorki respectively to Siberia. From Vyatka a line was constructed to Kotlass, in the Northern Region. New lines which have recently been completed include those from Kotelnich to Gorki, from Yar to Phosphoritnaya, and from Cheboxari to the Moscow-Siberia line. The Yar-Phosphoritnaya line is

of particular value since it renders possible the exploitation of the iron and phosphate deposits which are now mined near the latter town.

In the Chuvash Autonomous Republic, notorious in the past for its lack of communications, a modern network of motor highways has been constructed. Yoshkar-Ola, in the centre of the Marii A.S.S.R., is served by a branch line from the main Moscow-Kazan-Siberia trunk line.

Population

About one-half of the entire population of the northern forest region is concentrated in less than a quarter of its area, on the south bank of the Kama and Volga, where climatic and soil conditions are more favourable for agriculture, and where industry and commerce may be carried on close to the Volga waterway. In the north-east, in the basin of the upper Vetluga, the country still remains thinly peopled, and covered by virgin forest.

Of the population, 85 per cent. is Russian, 10 per cent. Chuvash, and 5 per cent. Marii. Cheboxari, on the Volga, is the administrative centre of Chuvash A.S.S.R., a region noted in Tsarist Russia as having the greatest number of beggars and the largest number of people suffering from trachoma. Conditions have changed rapidly in the last twenty years, however. Not only has the area of arable land and the number of cattle increased greatly, but such industrial undertakings as the Shumerlinsk wood-working plant, the Kanashk wagon-repair works, and the exploitation of phosphate and shale deposits have resulted in a marked increase in the urban population. The Marii Autonomous Republic has undergone a similar transformation. The table given at p. 445 shows the position reached by 1939 in the various administrative divisions of the northern forest region of the Povolzhye.

These statistics demonstrate clearly that the population of the upper Volga is still predominantly rural and that the most important concentration of urban population is found in the newly developed industrial area of the Gorki region.

ADMINISTRATIVE DIVISION	URBAN	RURAL	TOTAL
Gorki Region (Gorki: 644,116) .	1,218,900	2,657,374	3,876,274
Kirov Region (Vyatka: 143,189)	328,869	1,896,460	2,225,329
Chuvash A.S.S.R.	131,533	946,081	1,077,614
Marii A.S.S.R.	75,873	503,593	579,466
Total	1,755,175	6,003,508	7,758,683

THE WOODED STEPPE REGION

South of the Volga, where it flows from west to east between Gorki and Kazan, the relief of the land changes, rising on the right bank of the river to the Pre-Volga Heights. The relief is largely determined by pre-glacial tectonic factors. The surface has been considerably affected by faulting and fracturing, factors which have produced the Dzhiguli Mountains and the Samara Luki. The latter, a block of hard rocks raised up by faulting, compels the Volga to make a large detour.

The former, dissected by steep, narrow valleys, presents a landscape of steep-edged wooded heights overlooking the Volga. Everywhere, in fact, the Pre-Volga Heights fall steeply to the right bank of the river, and bring about a definite increase in the precipitation,¹ while the greater variety of soils found upon the plateau surface presents favourable conditions for agriculture—in contrast to the low-lying flat or undulating, and rather arid country of the opposite bank, where only in the south is the monotony broken by the rolling upland country and broad, gently sloping valleys of the Obshchy Syrt hills.

South of the Volga-Kama junction, owing to the milder climate, the forests (now largely cleared for agriculture) include deciduous trees such as the oak. The diminution in precipitation towards the south and east brings about the transition to the wooded steppe type of vegetation, changing

¹ The Pre-Volga Heights, by protecting the lands along the eastern bank from westerly winds, reduce the precipitation in these areas.

to open steppe land in the more arid regions of the left bank of the Volga in the latitude of Kuibishev.

The increased fertility of the soils which accompanies this change in the vegetation is responsible for the prevalent agricultural character of the economy of the middle Volga lands. But there is a marked differentiation between the agriculture of the east and west banks of the river, reflecting the differences in climate, relief, and soils described above. Wheat-cultivation, together with the breeding of sheep and cattle, forms the main occupation of the drier east. The problems of lack of labour, due to the low density of population, and the frequent occurrence of drought have been overcome and the acreage of grain increased by irrigation projects, and the employment of extensive and mechanized dry-farming technique. This has involved the organization of enormous state farms, the introduction of drought-resistant plants, such as maize and sunflower, in addition to drought-resistant types of wheat, the building of reservoirs, and the planting of wooded zones and belts of trees around the fields in order to conserve the snow during winter. The snow protects the ground from frost, and moistens the soil in spring.

The cattle and sheep farms specialize in meat- and wool-production. The rearing of pigs, fed on grain, is also important.

The former poverty of the peasants on the left bank of the Volga was regarded as being the result of drought, while the miserable state of the peasantry on the rich lands of the right bank was attributed to over-population. But the problem of over-population has been no more difficult to overcome than that of drought. The old three-field system of farming has been superseded by a scientific system of crop-rotation and intensive agriculture, with a great increase in the proportion of crops which possess a high value and require a large amount of labour. Such crops are flax, hemp, potatoes, and sugar-beet.

This intensive mixed type of farming also includes the breeding of pigs, poultry, and dairy cattle, vegetable-growing, and orchard-cultivation.

Industry

In the past there were few industries of national importance. Handicraft industries were developed to a great extent, and from the lands on the right bank of the Volga, where the primitive system of agriculture could not employ a dense population, there was a regular flow of men to the mines of the Don basin, the lumber-camps of the north, and to the barges and river vessels of the Volga. Terrible famines decimated the population from time to time, as a result of periodic droughts, for the lands of the middle Volga, especially those on the left bank, lie in the transitional zone between the agricultural and pastoral regions of the U.S.S.R.

Within recent years a number of new industries, engaged in working up agricultural products, have been established, and older ones have expanded. Wool, leather, and skins provide the raw materials for the manufacture of textiles, clothing, boots and shoes; starch (from potatoes) and vegetable oil (from sunflower-seed) are manufactured. Bones and wood are used in the chemical industry, while the forests of the north supply wood which is brought downstream to wood-working and match factories, and the paper and wood-chemical works at Kondopobsk. Linen factories have been built, and the dressing and manufacturing of furs from the north is a very important occupation.

The food industry includes flour-milling, distilling, butter-manufacturing, meat-processing and packing. Syzran and Ulyanovsk are the chief centres of the leather, food, and saw-milling industries.

At Saransk, the capital of the Mordovian A.S.S.R., there is a large preserved-milk combine.

In addition to the industries which depend directly upon agricultural products there are others which rely upon local mineral deposits and supplies brought to the industrial towns by river. The Tartar Republic possesses a powerful regional electric-power station at Kazan. Tin is manufactured from local deposits, and the production of cement at Volsk and Kuibishev is of national importance. Combustible slates

found at Kashpir (south of Syzran) to the south-east of Kuibishev, and at Undori (north of Ulyanovsk), are used as fuel for the generation of electricity, and the waste products supply raw materials for the chemical industry. The Syzran combustible shale refining plant and the Kashpir electric-power station work in conjunction on this basis. The electric power is transmitted, together with that of the other stations on the Volga, through the regional grid transmission system to various industrial centres, such as the woollen and clothing factories of Penza and Ulyanovsk, and the metal-working industries of Kuibishev. The latter are supplied with nickel, copper, chrome, and iron from the Orenburg-Khalilov region, (see p. 427), and manufacture transport machinery, carburettors, etc. Combustible slates, however, are not the only source of fuel. The Saransk power station, for example, uses peat, while the Kazan and Kuibishev stations, and other industrial undertakings, utilize coal and oil¹ brought along the Volga from the Don basin and Baku respectively. This accounts for the fact that most of the factory towns are situated close to the river or its larger tributaries.

Phosphate deposits (*e.g.*, in the Dzhiguli Mountains) provide raw materials for the manufacture of fertilizers. At Kazan there are chemical, wagon-building, and engineering works, and one of the largest Soviet factories for the manufacture of typewriters. There is mass production of machines with Latin characters, used by the various national groups of Turkic origin. In Tsarist times these peoples were not generally permitted to use their native languages in schools, trade, commerce, law, etc. But with the development of education and the granting of full citizenship to national minorities, there has arisen a great demand for books and literature in languages which use the Latin alphabet.

¹ Oil-wells were opened in Syzran in 1937. The two Kuibishev hydro-electric stations, when completed, will provide the most important source of power for the entire Povolzhye. They will form the largest hydro-electric enterprise in the world, with a total capacity of 3.4 million kw. The dam across the Volga will provide water for the irrigation of the arid eastern lands, and will assist the navigation of the upper Volga and the Kama.

Transport and Communications

The significance of the Volga and its chief tributary, the Kama, cannot be over-stressed. It was around the junction of these two great rivers that the ancient kingdom of the Kama Bulgars was founded, and later, that of the Tartars with the capital at Kazan. The Tartars, in turn, were conquered by the Moscow State. The importance of Kazan, situated at the junction of the main east-west route with the Volga, running from north to south, was increased when it became also the junction between railway and waterway.

The early development and colonization of the remainder of the Volga lands was closely associated with the commencement of regular river navigation in the middle of the nineteenth century, and the construction of railway-lines from Europe to Siberia and Central Asia. It was the growth of the transport system which not only increased the trade and commerce of towns on the Volga but also brought about the conditions in which their industries could expand.

Population

It is not surprising that large cities such as Kazan and Kuibishev are situated at points where the main railway-lines cross the Volga. Kazan (401,655) is the administrative centre of the Tartar Republic. Kuibishev (Fig. 46), a town of more than 390,000 inhabitants, is the centre for the whole of the middle Volga region. The town lies on the great bend of the Volga, at the junction with the Kuibishev river. It is an important point for the transshipment of grain from river to railway, and in consequence contains large grain-elevators and flour-mills. Northern timber, trans-Volga grain, Turkmenistan cotton, on their journeys by rail and river, meet here. Food products, transport machinery, and building materials (*e.g.*, asphalt, cement, etc.) are manufactured in the town.¹

¹ The importance of Kuibishev will be further increased by the completion of two new hydro-electric stations with a capacity of 3·4 million kilowatts.

Ulyanovsk (102,106) lies on the right bank of the river, at the crossing of the Ryazan-Ufa railway-line. At Syrzan (77,679) the railway crosses a bend of the Volga on its way from Penza, a town on the Sura river, to Kuibishev. Penza is also at the junction of the lines from Gorki and Kazan to Saransk and the Don basin.

Everywhere in the Middle Volga Region there is a sharp differentiation between the density of population on the west and east banks. But on both sides of the river, in spite of the remarkable increase in the size of the towns, the population is still largely rural.

The total population of the Middle Volga Administrative Region was 2,767,562 in 1939, and of this number nearly two million people were living in villages or rural districts, and of the urban population more than 70 per cent. was concentrated in Kuibishev, Ulyanovsk, and Syrzan. The Tartar Republic is not, strictly speaking, included in the lands of the middle Volga. Geographically and economically, however, it occupies a transitional position between the northern and central parts of the "Povolzhye," and it is convenient to include it in the central part, since the most populated area of the republic, situated close to the river Kama, comes within the wooded steppe and broad-leaved forest zone. The population in 1939 was slightly more than 2,900,000. The 400,000 inhabitants of Kazan constituted about two-thirds of the urban population of the republic.

In the middle Volga lands as a whole about one-quarter of the people belong to the Tartar, or Mordovian national groups, while there are small numbers of Chuvash, Marii, and Bashkir peoples. The remainder are mainly Russians.

THE STEPPE LANDS OF THE LOWER VOLGA

The north-western corner of this region is occupied by the Pre-Volga Heights, which extend as far south as Stalingrad, and are then continued in the low Ergeni Hills. In the north-east there are the low foothills of the Obshchy Syrt.

South and east of these hills the Caspian Lowland, a

monotonously level plain which formed the bed of an enlarged Caspian Sea in recent geological times, extends to the shores of the Caspian and into Kazakhstan.

Traces of the ancient sea are still to be found in the numerous

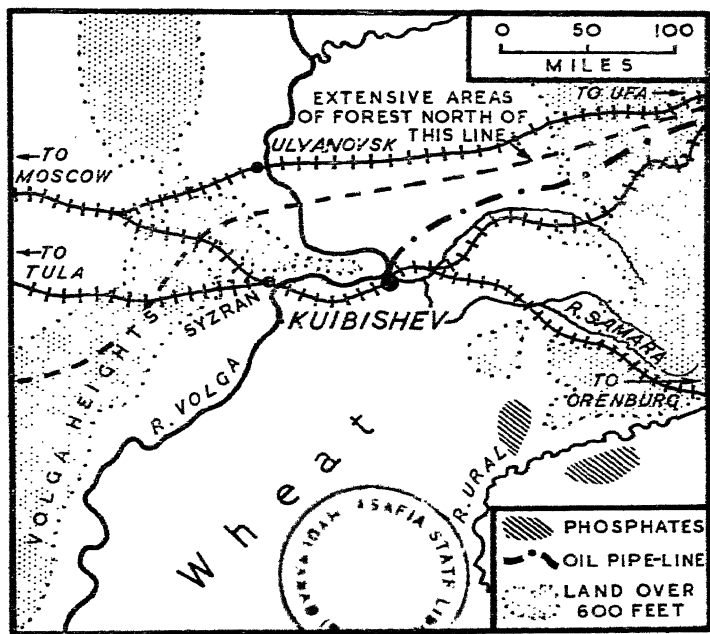


FIG. 46. THE POSITION OF KUIBISHEV

salt lakes, the largest of which are Lakes Elton and Baskunchak. The latter is $12\frac{1}{2}$ miles long and $4\frac{1}{2}$ miles wide.

The landscape is one of reddish-brown or grey sands, in some places completely devoid of vegetation; in others partly covered with patches of tufty and frequent saline grasses. Near the shores of the Caspian it is possible to travel for long distances with nothing to meet the eye but sands, salt deposits, and salt lakes. Sand and soil are impregnated with salt.

The wind raises clouds of salty dust and sand which foul the wells and make human life exceedingly difficult.

The climate is dry and continental in the extreme. Astrakhan is as cold as Pskov in winter. There is practically no snow cover to protect the soil. In summer hot, dry winds from the deserts of Central Asia cover the farms of the damper steppe lands west of the Volga with a fine dust, and often completely wither and destroy the crops.

The black soils of the north-western corner of the region, however, are exceedingly fertile, and the climate is moister and consequently more favourable for agriculture.

Between Saratov and Stalingrad the soils are mainly of the chestnut-brown type, fertile, but limited in their productive capacity by the small amount of precipitation. In the arid lands south-east of Stalingrad a narrow strip of green on either side of the Volga runs across the countryside, strongly reminiscent of the lands on either side of the Nile. The rich alluvial soils are of great value for agriculture. Close to the Volga there are dense thickets of reeds and rushes, four to six metres in height, with the red Indian lotus growing in their midst.

The marked differentiation between the north-west, central, and southern sections of the lower Volga region is reflected in the following table:

AREA	PRECIPITATION (ANNUAL), IN INCHES	POPULATION (MAINLY CONCENTRATED IN VILLAGES), PER SQUARE MILE
North-west . . .	11.8 to 17.7	104.0
Central Steppe . . .	5.9 to 11.8	36.0
Southern Dry Steppe and Semi-desert .	Under 5.9	3.6

The Volga is the highway which unites these three sections and provides large areas near the river with water. Below Stalingrad spring floods extend over a belt of land on either side of the river to a breadth of 28 miles, converting it into a huge 'oasis,' where orchards and melon gardens flourish.

After the sixteenth century the north-western part of the region, near Saratov—the area most suitable for agriculture—was colonized by the Russians fairly rapidly. The drier steppe lands to the south-east remained for a long period the domains of nomadic cattle-breeders, such as the Kalmucks. Only when the Siberian lands had been colonized, and when regular navigation of the Volga and the construction of railways enabled agricultural surpluses to be transported to markets in the more thickly populated areas of European Russia (especially in the north, where there was a deficiency of grain), did large numbers of farmers come to settle on the drier lands. Between 1897 and 1912 the population of the lower Volga region more than doubled, and the acreage under grain increased in proportion, so that by 1912 this part of Russia provided a large surplus of wheat.

The low technical level of agriculture—the lack of fertilizers, the cropping of the fields until the soil became exhausted, and the ever-present possibility of droughts such as that which produced the great famine of 1921—eventually threatened the region with economic ruin.

By 1932, however, re-organization was well under way. Large mechanized state farms were created and the sown area was greatly increased. Crop-specialization has been introduced, so that to-day rye and oats, together with potatoes, sugar-beet, and vegetables, are the main crops in the extreme north-west. Further south, sunflower and wheat are cultivated, while near the cities, especially Saratov, market gardening, pig-breeding, and dairy farming are important occupations. The Volga flood-meadows provide excellent pasture for cattle.

In the central steppe zone more than 50 per cent. of the sown area is devoted to wheat. Tobacco, water melons, and mustard are the most important secondary crops. On the left bank of the river cattle and sheep are reared. Enormous tracts of land on the left bank have recently been brought under cultivation by means of the Volga Irrigation Scheme (see p. 462).

In the southern zone drought restricts the sown area,

and the farmers specialize in the production of meat and wool.

These dry steppe lands, suffering from saline soils, summer heat and drought, and extreme winter cold, are inhabited by the Kalmucks, a nomadic group of people which migrated from Western China in search of new lands over three hundred years ago. They received a bitter reward for their endeavours in these desolate plains. Their cattle often died of starvation, and life was so hard that during the eighteenth century a large proportion of them decided to make the return journey to China.

Scientific methods of farming have considerably lightened the lot of these unfortunate people. In 1936, for example, the great Arshan-Zelmensk reservoirs were constructed, and although farming is still mainly of the pastoral type, the acreage under crops, especially maize, was increased three and a half times between 1917 and 1937. About a third of the sown area is on large state farms, and the greater part of the land under crops is on the right bank of the Volga where the drought is not so severe.

In contrast to the dry steppe region which surrounds it the land close to the Volga and its delta possesses exceptionally favourable climatic and soil conditions. The summers are hot, while the spring floods and irrigation works have made possible the intensive cultivation of melons, quince, tomatoes, grapes, vegetables, cotton, and sesame, as well as new industrial crops such as kenaf and kender.¹

This type of intensive cultivation has been extended to the lands above the delta, where the Volga branches into a large number of channels, the largest of which forms the river Akhtubia. Between the latter river and the main stream the country consists of a maze of rivers and islands fringed with reeds, rushes, and tall grasses, and inundated by floods each spring. Embankments and drainage works to control the floods, and irrigation channels to take water to the dry lands on either side of the rivers, have been constructed, so that to-day the lands on either side of the Volga, between Stalin-

¹ See p. 214.

grad and the Caspian Sea, form one of the most important areas of intensive agriculture in the whole of the U.S.S.R.

But the wealth of the lands near the Volga consists not only of the products of agriculture. About 40 per cent. of the fish caught in the waters of the U.S.S.R. are caught in the lower Volga, the delta, and the waters of the Caspian close to the delta. The slow-flowing Volga brings down enormous quantities of organic matter, and the waters in and near the mouth are shallow and much less saline than elsewhere in the Caspian Sea. These shallow waters and the numerous gulfs and inlets around the delta form excellent breeding-grounds for fish of many kinds. The black caviare from the Volga is renowned throughout the world, the Soviet Union possessing a monopoly of this delicacy.

Special areas have been set apart as breeding-grounds for fish, and the fishing industry has been organized on modern lines, making use of steam trawlers, motor-boats, modern nets and equipment. Astrakhan is the U.S.S.R.'s most important centre for the fishing industry. Fish are transferred at the port from sea-going ships to river vessels, or sent to the canning, preserving, and refrigerating plants which have been constructed there. Salt used in certain curing processes is obtained from the deposits at Lake Elton and Lake Baskunchak.

Fishing is also carried on higher up the river between the delta and Stalingrad. There is a canning and preserving plant at Lagan.

Industrial Occupations

We have already noted the general deficiency of mineral resources in the Volga lands. Iron ore is now mined near the Khopier river, cement clays are obtained from Volsk, natural hot gases near Derbachi, slates and shales in the outliers of the Obshchy Syrt Hills, phosphate deposits in the Volga Heights between Saratov and Kamyshin, and salt from Lakes Elton and Baskunchak.

Apart from these local resources, raw materials may be brought along the river from other regions, while the products of agriculture provide the basis for a number of industries.

The canning of fish, fruit, meat, and vegetables is now of great importance.

Since ancient times trade was carried on at various points along the river, where the overland routes from the east crossed the water route from the Caspian. The Russians, after they had colonized the Volga lands, began to concentrate upon the working up of agricultural raw materials, manufacturing flour, vegetable oil (from sunflower-seed), tobacco, leather, and soap. At a later stage coal and iron were brought from the Ukraine and the Don basin, wood was floated down the river from the north, cotton was imported from Central Asia, and these materials formed the basis of metallurgical and timber industries at Stalingrad and textile manufactures at Saratov. After 1917 regional power stations were constructed at these towns, the former employing coal-dust and waste products from the mines of the Donetz coalfield, the latter using coal and oil and combustible shales. A further source of power will be the new hydro-electric station at Kamyshin (see p. 462).

Saratov, an important centre for trade and commerce since the seventeenth century, possesses the largest combine-harvester works in Europe, in addition to machine-building factories which specialize in the production of lathes, Diesel engines, and ball-bearings, oil refineries, flour and textile mills.¹ At Engels, across the Volga from Saratov, there are important timber and meat-processing and packing works. Cement is manufactured, from local materials, at Volsk.

Stalingrad is to-day² a large modern industrial city, with new factories and workers' settlements stretching along the Volga for several miles. High-quality steel and chemicals are manufactured. The foremost industry, however, is the mass-production of heavy caterpillar tractors for agriculture. There are also oil refineries, and saw-mills and woodworking plants, representing the modern development of the original

¹ The construction of a bridge across the Volga at Saratov, and the completion of the Uralsk-Iletsk railway, giving direct access to the Southern Urals and Kazakhstan, have done much to increase the industrial and commercial importance of Saratov within recent years.

² Before its destruction by the Germans in 1942.

industries, which commenced with the construction of the first saw-mill in 1880.

A new motor road runs from the city to Krasnoarmaisk, a river port which specializes in shipbuilding and the manufacture of internal-combustion engines and railway wagons.

The salt works at Lakes Elton and Baskunchak are of the greatest importance, since they supply about 25 per cent. of the salt used in the U.S.S.R.

The rôle of the Volga as an artery which supplies the industrial towns along its banks with coal, iron, oil, and wood, building materials, salt, raw cotton, and agricultural produce was strengthened by the construction of railways and the building of a small canal between the Don and the Volga at Stalingrad. When the new ship canal replaces the older canal, and the whole of the Volga is deepened to allow large ships to proceed from Astrakhan to Moscow (see p. 462), the lands close to the river will assume even greater importance. Stalingrad, which even in the days before 1917 was described as the "solar plexus of the Russian grain belt," will then become a great industrial metropolis.

Population

Apart from the towns, the population decreases in density from north-west to south-east, reflecting the decrease in precipitation. The lands close to the river and around the delta are distinguished by an extremely dense population.

Russians form 75 per cent. of the population, Germans 8.5 per cent., and Kalmucks over 8 per cent. The remainder consists of small groups of Tartar, Chuvash, and Mordovian peoples. The German population before the German-Soviet war was concentrated in the German Volga Republic, with its centre at Engels. A large portion of the lower Volga lands west of the river and south of Stalingrad is included within the boundaries of the Kalmuck Autonomous Republic.¹

The expansion of industry has resulted in a rapid increase in the urban population, the proportion of which is now a

¹ Now a province of the R.S.F.S.R.

little above the average for the U.S.S.R. as a whole. The chief towns are situated on the banks of the Volga, at the junction between river and railway-lines, where the transshipment of goods from rail to river and *vice versa*, the storing and warehousing of goods, trade and commerce, are occupations second in importance only to industry.

Stalingrad (445,476) is the economic and industrial centre of the entire lower Volga region. It is the administrative centre for a large area, with a total population of 2,250,000. The importance of the industrial towns is reflected in the fact that approximately 893,000 of the inhabitants of the region were classed as urban in the 1939 census, and of these more than 700,000 lived in Stalingrad and Astrakhan. Thus the population statistics present a picture of a relatively thinly peopled agricultural area, with a small number of large industrial centres. The Kalmyck Republic has a population of only 220,723, in spite of its enormous area. About 20 per cent. of the population is urban.

Stalingrad owes its importance to its central position in relation to the rich southern grain lands of European Russia and the coalfields of the Don basin, and its situation at an important railway junction, at the point where the Don and Volga come close to each other (Fig. 47). It is a junction between north and south, Europe and Asia, a river port, connected by means of rail and river with Northern Russia, Moscow, the Urals, the Don basin, the North Caucasus, the Caspian, and Central Asia. The rapid growth of its industries is reflected in the increase of its population, from 20,000 in 1920 to almost half a million in 1939.

Saratov also occupies a central position, second in importance only to that of Stalingrad. It has a population of 375,860, and is the administrative centre for a region with a population of 1,798,800, 61 per cent. of which is rural. Saratov itself was superseded by Stalingrad as the administrative centre for the entire lower Volga region in 1931. In addition to being an industrial town it is an important rail-river junction, at which cargoes are transferred from boats to the railway-line which runs eastward to Moscow. Other

lines run south-west to the Don basin, eastward to the Urals, south to Astrakhan, and south-east to Central Asia.

Across the river from Saratov is Engels, the centre of the German Volga Republic, the total population of which is

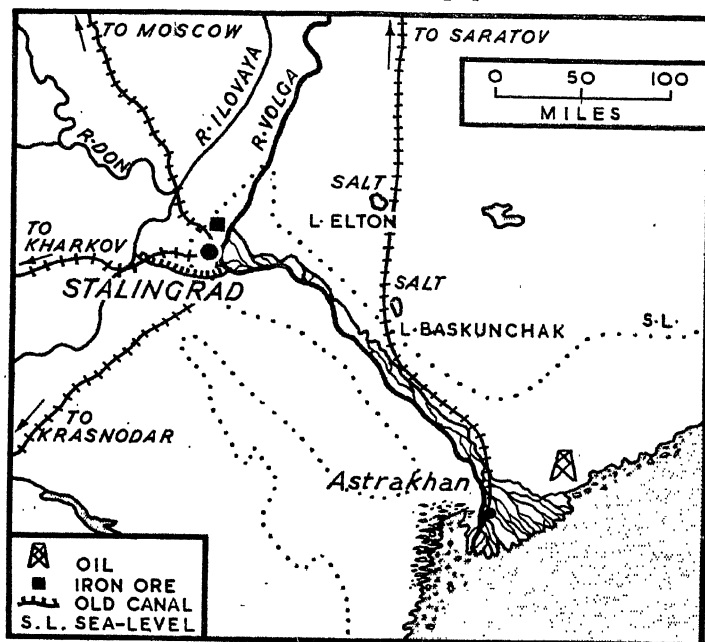


FIG. 47. THE POSITION OF STALINGRAD

605,545. Nearly 75 per cent. of the population is rural, and more than a half of the urban population is concentrated in Engels (73,279).

Astrakhan (253,655), the centre of the fishing industry, is situated at the point where cargoes are transhipped from sea-going vessels to river boats, and *vice versa*. It is connected by rail with Moscow (via Saratov) and with the important salt works at Lake Elton and Lake Baskunchak. Elista, a new town, is the capital of the Kalmuck A.S.S.R.

The population of the entire Povolzhye area is about 23,000,000. About 25 per cent. of the people belong to native groups. The first settlers, in ancient times, were the Finnish groups, followed by the Turkic groups. The two groups of peoples have considerably intermingled. Lying astride the great overland route into Europe, which was followed by successive waves of nomadic invaders from Asia, the region to-day possesses the remnants of many former nationalities. To-day each national group has its own territory, and forms an autonomous district or republic.

Of the various administrative areas of the Volga lands the Stalingrad region has the largest extent, and the Kuibishev region the largest number of inhabitants. In fact, in the south and east generally population is particularly scanty in the rural districts and particularly concentrated in industrial towns. In the north-west, however, there is a relatively dense agricultural population—a most positive reflection of the influence of soil and climate. In the Stalingrad region, for example, the average density of population is only 12 persons to the square kilometre. Twenty-nine per cent. of the total population is urban. In the Tartar Republic and the Kuibishev region, in contrast, the average density is as high as 40 per square kilometre—but only 12 or 13 per cent. of the population is urban.

The Mordovians of the west, near the river Moksha, the Marii, settled mainly between the Vetluga and Vyatka rivers in the north, and the Udmurts of the north-east are all remnants of original Finnish stock. They represent a total population of about two and a half millions. About three and a half millions belong to the Turkic group—the Tartars, living chiefly in the lower Kama, but spread throughout the region, the Chuvash on the eastern side of the river Sura, and the Bashkirs in the south-east. The Kalmucks are of Mongol origin, while the Germans represent the descendants of families who fled from their own country during times of religious persecution (see p. 166). Of the entire population 75 per cent. is Russian, with some small admixture of Ukrainian.

Summary

The lands along the Volga are characterized by a general lack of large-scale mineral resources. Industry depends more upon raw materials brought to the towns by river and rail than upon those produced locally. Thus the lack of raw materials other than agricultural products is balanced by an excellent geographical position, and although practically every town along the banks of the Volga is engaged in some section of the food industry and the working up of agricultural produce, metallurgical, chemical, textile, and engineering industries are assuming an ever-increasing importance.

In agriculture the north specializes in dairy-farming, pig- and poultry-breeding, the production of flax, rye, and oats; the central region specializes in the cultivation of sunflower, hemp, mustard, wheat, etc., while the drier lands of the south and east are important for the production of meat and wool. The flood lands and irrigated areas near the river and its delta specialize in the cultivation of cotton, the vine, melons, fruit, and vegetables.

The importance of the Volga lands in the economy of the U.S.S.R. as a whole lies in their ability to produce surpluses of both agricultural and industrial products for use in other parts of the country.

THE "GREAT VOLGA" SCHEME

Although the Volga has for long been a great and important waterway, passing as it does through lands containing about a quarter of the entire population, and carrying some 35 per cent. of the river traffic of the Soviet Union (about 30,000,000 tons a year), it suffers from some serious defects. For example, it suffers from enormous floods during the spring, when great ice-floes are driven rapidly downstream by the fast-flowing current, while during the summer and autumn navigation is impeded by shallows. In the past large vessels could not proceed above Kazan.

Furthermore, much of the lands lying along the eastern bank of the lower Volga suffer from drought. The irrigation

of such vast areas is possible if a large amount of power is available for pumping water, since the steppe lies at a height of 200 to 300 feet above the level of the river. Consequently, in order to make the fullest use of the Volga and the adjacent lands, three problems had to be solved—the creation of a deep navigable waterway, the provision of electric power, and the building of extensive irrigation works on the left bank of the river between Kuibishev and Kamyshin. In order to solve these problems the “Great Volga” Scheme was initiated, and a great deal of the constructional work has already been completed. Eventually, about 1,500,000 acres of land will be irrigated for wheat-production.

Large dams, five on the Volga and three on the Kama, in addition to several smaller ones, have been built. A canal has been provided to cut across the bend of the river at Kuibishev, as well as canals and locks to allow vessels to pass round the dams. These dams regulate the flow of water, holding back the spring flood waters, and filling the lower course of the river during the summer. They have also brought about an increase in the depth of the river and a reduction in the speed of the current, so that navigation is now much easier than it was in former days. The dams, by raising the level of the water, also provide power for a number of hydro-electric stations, several of which are already operating. Eventually there will be twenty of these power stations, with a total annual output of electricity of 6,500,000 kilowatts—of immense importance to the industrial development of the regions lying near to or even some distance away from the Volga, where local deposits of peat and combustible shales, and coal from the Donetz or oil from Baku, are the only other sources of power.

The Kamyshin hydro-electric station will have a vast reservoir, able to supply water to irrigate more than ten million acres of arid land, which will be able to produce an enormous crop of wheat. Hydro-electric power will operate pumps which will convey water to a number of small reservoirs in the drought-stricken area. This project, however, would reduce the amount of water entering the Caspian to such an

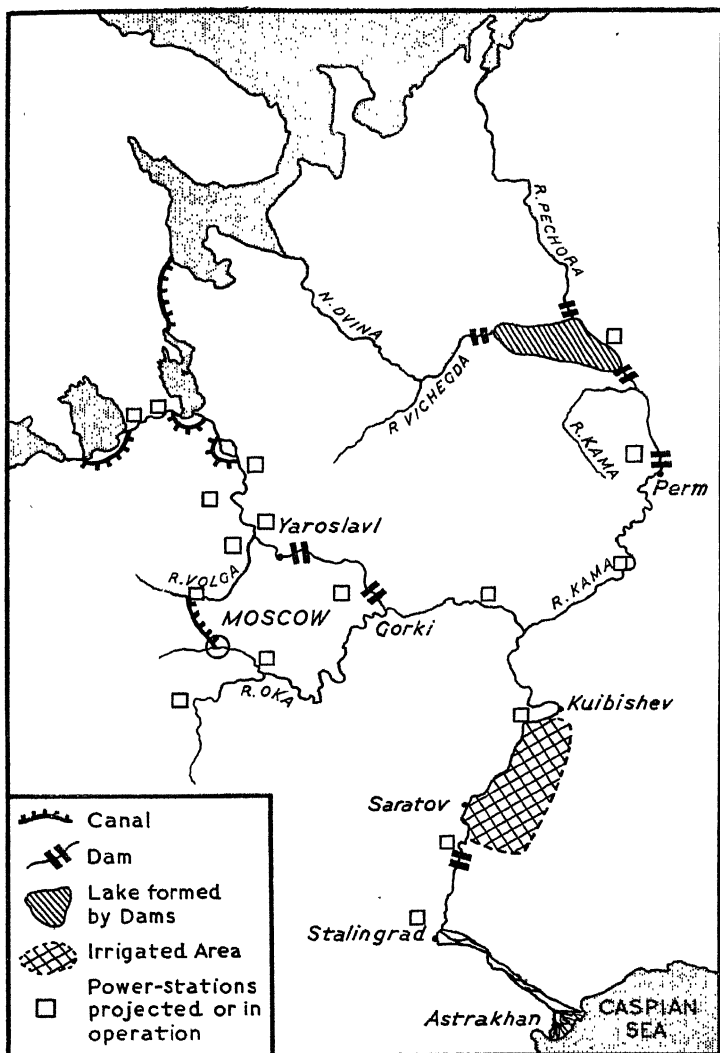


FIG. 48. THE "GREAT VOLGA" SCHEME

extent that the level would fall considerably, and the ports and fisheries would be ruined. In order to avoid this the upper courses of the northern rivers—the Pechora, Sukhona, and Vichегда—have been tapped, and are fed into the Volga through the Kama (Fig. 48). This has necessitated the construction of a great lake at the junction of the Vichегда, Kama, and Pechora. Ships will eventually be able to sail directly from the Arctic along the North Dvina and Vichегда, or along the Pechora, carrying timber and coal, for example, down the Kama, and by way of the Volga to the south.

The recently completed Moscow-Volga Canal (see Chapters XVIII and XIX) already enables large river steamships to pass into the heart of Moscow. The reconstruction of the Mariinsk canal system will ultimately allow them to proceed to the Volkhov river, into Lake Ladoga, and thence to Leningrad, or through the Baltic-White Sea Canal to the White Sea.

The Don-Volga Canal and the Manych-Kura Canal will give direct access to the Black Sea. Finally, a canal linking the Chusovoya, a tributary of the Kama, with the Iset, a tributary of the Ob, and another canal linking the Ob with the Yenessei and the Angara, will create an enormous waterway from the Volga to Lake Baikal.

Eventually, Moscow will be the centre of the most remarkable system of inland waterways in the world.

BIBLIOGRAPHY

Russian

Articles published in "Nasha Strana" (Moscow)

- N. ANOV: "The Vyatka District," in No. 7, 1940.
M. KOSTAREV: "Dear Chuvashia," in No. 1, 1941.
N. BOBICHIN: "Bashkiria," in No. 4, 1939.
V. ZENKOVICH: "The Marii Republic," in No. 5, 1939.
E. LVOVA: "Kazan," in Nos. 4, 5, 1940.
V. VIKTOVICH: "In the Birthplace of Lenin," in Nos. 4, 5, 1940.
"The Soviet Nile" (Lower Volga), in Nos. 10, 11, 1939.
M. RAIKHENBURG: "The Kuibishev District," in No. 4, 1939.
I. I. FREIDIN: *Soviet Chuvashia* (Moscow, 1940).

CHAPTER XVI

The Caucasus and the Crimea

The Caucasus

THE Caucasus is a region which forms a broad isthmus between the Black Sea and the Caspian. It connects the south-eastern part of the U.S.S.R. with Asia, and separates it from Turkey and Iran. It is one of the most southerly, warmest, and richest regions of the Soviet Union, including within its boundaries the rich steppe lands of the Don-Kuban country, the thick forests and snow-capped mountains which overlook the deep-blue waters of the Black Sea, and valley lowlands, which experience an almost sub-tropical climate, and where a variety of sub-tropical plants grow freely.

The Caucasus may be divided into three major natural regions: the Pre-Caucasus, a land of plains and including the foothills of the Caucasian mountain ranges; the Great Caucasus, comprising the main mountain ranges; and the Transcaucasus. The greater part of the two latter regions are included within the three Soviet Republics of Georgia, Armenia, and Azerbaijan. The former comes within the boundaries of the North Caucasian, or Rostov, region.

THE PRE-CAUCASUS

The lands of the Pre-Caucasus occupy one-half of the area of the entire Caucasian region. Low plains, in which the Don valley and the Manych-Kuma depression form the only significant features of relief, extend from the Black Sea to the Caspian. They are separated from the foothills of the Caucasian mountain ranges by the valleys of the Kuban and Terek rivers, which run towards the west and east from the elevation of the Stavropol Plateau (Fig. 49).

South of these valleys the relief of the land becomes more varied, the surface being dissected by deep valleys and ravines.

Near Pyatigorsk a group of cupola-shaped mountains rise in the midst of steppe plains. Their structure shows that they are of volcanic origin, having been produced as a result of molten volcanic matter pushing up from below bending the crust of sedimentary rocks. Weathering has exposed the volcanic rocks in some places, and these upswellings are to-day marked by the presence of hot and cold mineral springs, famous for their medicinal properties throughout the U.S.S.R. (see p. 487).

The Kuban and Terek rivers are fed by glaciers high up in the Caucasian Ranges, and hence contain most water when the glaciers melt in the summer when water is most needed for agriculture. The mountain torrents and rapids of their upper courses render them useless for navigation, although they are of immense value as possible sources of hydro-electric energy. When the rivers reach the lowlands they branch out into a multitude of shifting channels, forming a labyrinth of lakes and marshes. The channels rapidly become choked with alluvium, so that even the Kuban, a large river, is navigable only below Krasnodar. Apart from the Don, no other rivers are used for purposes of navigation in the Pre-Caucasus.

The Pre-Caucasian plains not only form a continuation of the East European Plain; they also offer no obstacle to the penetration of the climatic conditions of Eastern Europe far south, to the foot of the mountains. Of course the southern latitude brings about a reduction in the length of the winter. Nevertheless, extremely severe frosts are possible, especially in the east, where cold winds from the interior of Asia bring dry, frosty conditions in winter and a dry, hot climate in summer. This is in strong contrast to the west, which lies open to the influence of mild westerly winds from the Black Sea and the Mediterranean. Consequently the winters are mild and the precipitation is heavy, especially in the south-western corner, close to the mountains and the Black Sea (see p. 96). Thus the physical regions of the Terek and Kuban valleys are also climatic regions, and the Stavropol Plateau may be regarded as a climatic divide between them.

This contrast between east and west is further reflected in

both the natural vegetation and agricultural practice. Almost the whole of the land lying to the north of the main Caucasian ranges supports a steppe vegetation, with woods and forests only near the rivers and along the slopes of the mountains

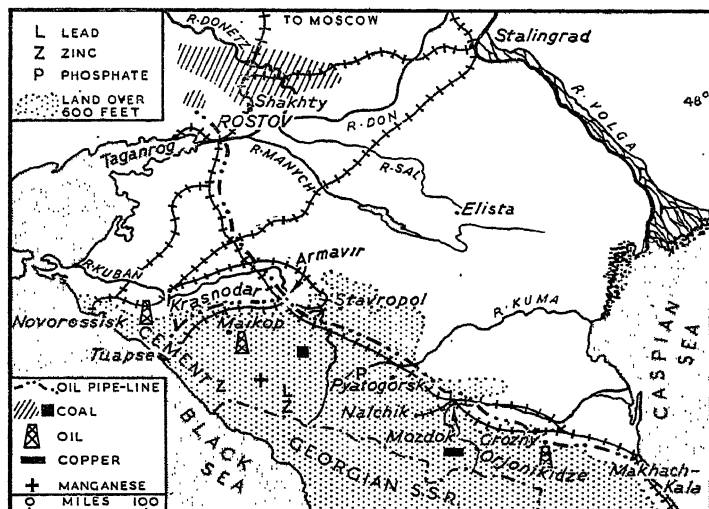


FIG. 49. THE PRE-CAUCASUS REGION

and foothills, where the higher land enjoys an increased precipitation.

In the west, however, there are fertile black soils, while the climate is relatively damp, and the winters, in particular, are mild. Above the dark green of the thickly forested mountain slopes, rise majestic snow-capped peaks. Below the forests vast golden fields of maize and wheat stretch across miles of flat and rolling country to the horizon. More than 15 per cent. of the total area under crops is found in huge state farms. The low-lying open nature of the country favours the development of large-scale mechanized farming (see p. 225).

The main crops are spring wheat in the north, near the

river Don and its tributaries, and winter wheat in the south. The Pre-Caucasus produces about 10 per cent. of the wheat grown in the whole of the U.S.S.R. Since 1917 maize, the second important crop, has displaced wheat to a great extent. It is extensively grown in the Kuban valley, while in the foothills of the Caucasus it has displaced almost every other crop. The reason for this is that maize requires a higher summer temperature than wheat, so that it can be grown on a large scale only in the south, while wheat can be produced in many other parts of the U.S.S.R. Sunflower is the third important crop, occupying a large acreage in the Kuban lands. The seeds are used for the production of vegetable oil, and the waste from this industry is a valuable source of fodder for hogs, which are reared in large numbers. In the Kuban valley intensive cattle-breeding is carried on, on the basis of sown grass.

The warm, damp climate of the Kuban valley and Black Sea coast favours the growth of special crops such as cotton, jute, and tobacco. The wet forest belt of the western foothills, stretching from the Taman Peninsula to the Laba river, a tributary of the Kuban, supports extensive tobacco plantations. Cotton, a new crop, has been successfully introduced into the moist lowlands of the Taman Peninsula and the Kuban valley, while rice, which requires much moisture and irrigation, is grown on the flooded alluvial lands near the mouth of the river (see pp. 201 and 223).

Climatic and soil conditions are also suitable for viticulture and the cultivation of fruit and vegetables. Grapes, apricots, the mulberry, apples, and pears are grown both along the Black Sea coast and in the valleys of the Don and the Kura. There is an important market-gardening region around the city of Rostov.

In the drier eastern plains, and especially on the poor steppe lands close to the Caspian shores, pastoral occupations—mainly sheep-breeding—predominate. Agriculture is confined to the river valleys and the Caucasian foothills, where the precipitation is heavier. In the Kura valley the chief crops are cotton, fruit, and the vine. Large areas of the lower Terek valley have been drained and adapted for rice

cultivation. The higher parts of the valley are devoted to orchards and viticulture.

Apart from cotton and rice, a number of new crops such as soya bean, Italian hemp, kenaf, kender, and rami are now successfully cultivated in the damper and warmer parts of the Pre-Caucasus.

Industry

As might be expected in such a rich agricultural region, many of the industries are concerned with the working up of agricultural raw materials. Rostov, Krasnodar, and Armavir are the chief centres of such industries as flour-milling, vegetable oil production, distilling, tanning, the preserving and canning of fruit and vegetables, tobacco-manufacturing, and the production of starch and treacle from maize. Rostov is also a more important centre for the production of champagne and wines. The industries mentioned above are carried on in most of the larger towns of the Pre-Caucasus.

Heavy industry, however, now occupies a more important position than those occupations mentioned above. Oil-production is the leading branch of industry, the output of crude oil, petroleum, etc., having increased to six times that of 1914. The largest oil-producing districts are situated close to the northern slopes of the Caucasus near Grozny and Maikop, and at Makhach-Kala, at the mouth of the Kura river. Oil is also found near Krasnodar and Neftegorsk. The Grozny region is the second largest producer of oil in the whole of the U.S.S.R., and the wells are of particular significance since they yield a greater proportion of benzine than the oil-wells of any other region in the Soviet Union. In 1934 new wells, which to-day yield an output approximating to 35 per cent. of the production of the Grozny district, were brought into operation at Malgobek.

Grozny is now a large industrial centre, engaged not only in the production of oil, but also in the construction of machinery for the oil industry and the manufacture of chemicals on the basis of by-products from the refineries.

Pipelines run to Makhach-Kala, on the Caspian coast,

to the Black Sea port of Tuapse, and to Rostov-on-Don, and beyond, to Nikitova. The latter pipeline will eventually be continued as far as the Dnepropetrovsk industrial region.

Altogether, the wells of the North Caucasus yield about 5,000,000 tons of crude oil a year,¹ or about 16 per cent. of the yield of the entire Caucasian oilfields. There are refineries connected by a pipeline at Grozny, Makhach-Kala, Armavir, Krasnodar, and Tuapse, with a total capacity of more than 10,000,000 tons a year. From Tuapse, petroleum and petroleum products are exported abroad, and from Armavir are sent to the Ukraine and the industrial regions of Central European Russia.

Coal-mining is carried on in the north-west of the Pre-Caucasus, at Shakhta, on the eastern end of the Donbas coalfield. There are some smaller deposits in the Caucasian foothills. At the port of Taganrog, on the Sea of Azov, iron-mining, metallurgy, and machine-building are important industries. Rostov possesses one of the largest agricultural engineering works in Europe, using metal from Taganrog, coal from the Donbas, and oil from the Caucasian wells. Locomotives are made at Novocherkassk.

Hydro-electric power is rapidly rising to first place among the sources of energy available for industry. Powerful electric stations have been constructed on the Guzeldo, Ardon, and Baikson rivers, and the electrical power produced here feeds the high tension power-transmission system, which also receives electricity from a number of power stations which utilize coal-dust and mineral oil as fuel.

In addition to oil-production, other important industries are the manufacture of cement, near Novorossisk, and the mining of zinc, lead, silver, and copper in the Sadon mines, to the west of Ordzhonikidze. The ores are concentrated in the village of Alagir, and then transported by rail to a large, modern, highly mechanized and electrified refinery at Ordzhonikidze, where sulphuric acid is also manufactured.

Many other minerals, particularly ferro-chrome, molyb-

¹ Figures for 1939, for the wells at Grozny, Maikop, Makhach-Kala, Malgobek, and Nadyzhinsk.

denum, and antimony, are mined in the Caucasian foothills. Finally, the need of artificial fertilizers for agriculture and the demand created by industry for a number of products have stimulated the growth of the chemical industry.

Economically, therefore, the Pre-Caucasus may be divided into the following regions: (1) the western plains, north of the Kuban; (2) the drier eastern plains, which support sheep and cattle; (3) the region of special cultures along the Black Sea coast between Novorossisk and Tuapse; (4) the regions of intensive agriculture and both agricultural and heavy industries in the eastern Don basin and the valleys of the Kuban, Kura, and Terek rivers and their tributaries.

THE MAIN CAUCASIAN RANGES: THE GREAT CAUCASUS

The main Caucasian mountain ranges, details of which are given in Chapter I, rise with relatively gentle slopes from the foothills of the north, but fall sharply towards the south. The mountains of the western end, composed mainly of limestone rocks, do not attain such great heights as are attained by the central ranges, in which crystalline and volcanic rocks predominate, and where the climate is more continental, the glaciers more extensive than in the Alps, and ten of the highest peaks exceed Mont Blanc in altitude.

Large areas of the lower slopes are clothed with thick forests, which have remained untouched for nearly two hundred years. They are now being intensively exploited, the timber being of great value for the aviation and motor-vehicle industries, the making of textile and agricultural machinery (beech and hornbeam), cart-wheels (ash), and parquet-flooring (oak).

In the south of this central region there is a series of almost parallel valleys and depressions, locked in on all sides by lofty mountains and ridges which link the main east-west chains.¹

¹ "The connecting ridges often form wide upland glens, sometimes at a great elevation. A typical example is Upper Svanetia and the Tush and Khevsur glens in the Eastern Caucasus. Here communities have lived in almost complete isolation for many centuries."—W. E. D. ALLEN, "The Caucasian Borderland," in the *Geographical Journal*, vol. xcix, Nos. 5, 6 (May-June 1942).

The eastern ranges, which continue into the mountainous country of Daghestan, are somewhat lower. The climate is very dry, and consequently the snowfall is lighter, the glaciers are smaller, and mountain slopes are bare and treeless.

Outstanding features of the highlands of Daghestan are the separate limestone tableland blocks and the black clayey shale formations, eroded into fantastic shapes. Between the mountains the numerous land-locked depressions and narrow, canyon-like valleys have exerted a very great influence upon the human geography, which in many respects is comparable with that of the North-west Frontier of India. In the past the peoples of Daghestan were isolated not only from the world outside but also from one another. Almost each valley or depression contains a separate national group. There are thirty-one such groups altogether, each possessing from one to five thousand people. Many of them had not seen a wheeled vehicle until recently.

To-day the broader Caucasian valley lands, such as those of the Sulak and Terek rivers, yield rich crops of cotton, kenaf, kendyr, and soya bean, as well as supporting orchards and vineyards. A considerable proportion of the sown area is irrigated. Herds of cattle, pastured on the steppe plains during winter, are taken up to graze on the mountain meadows during the summer. Sheep-rearing for wool-production is an important occupation.

New industries have been established. The machinery and engineering works of Makhach-Kala are of national importance. In the Derbent district natural gases and quartzite sands are utilized by the glass industry, and glass is manufactured more cheaply than anywhere else in the U.S.S.R. At Izerbash oil-wells have been sunk in a newly discovered oil-bearing region.

The powerful rivers are being harnessed to provide electric power. The river Sulak, fed by four tributaries from mountain glaciers, has a fall of 1980 feet. One hydro-electric power station is already in operation at Gergebilsk, and another, which will be larger than the famous Dnieper power station, has been planned.

The amazing economic development of Daghestan would not have been possible without the construction of roads. The old inter-tribal feuds were largely due to the isolation of the various groups, and the frequent occurrence of droughts and lack of food. Conditions were in many respects similar to those of the Khyber Pass region in India. The fact that these former mountain tribes to-day live together in harmony bears eloquent testimony to the solution of the problems which beset the country. Cattle-rearing is the main occupation of the people, with horticulture and viticulture in some of the valleys. Some cotton and wheat is grown. Makhach-Kala is the administrative centre of the Daghestan Autonomous Republic.

TRANSCAUCASIA

Transcaucasia is a mountainous country. The lower parts (below 2000 feet) together occupy only one-third of the total area. From the main Caucasian ranges the Suram Mountains (5000–6000 feet) branch out in a south-westerly direction, separating the Rion basin in the west from the larger Kura-Arax basin in the east, and linking the Great Caucasus with the Armenian highlands.

From the southern end of the Suram Range a vast system of mountains and plateaux extends towards the south-west and the south-east, forming the southern boundaries to the Rion and Kura basins. The south-eastern highlands—the Armenian plateau and peripheral highlands, 6000 to 7000 feet high—are traversed by the valley of the Arax, which cuts through the south-eastern end of the range known as the Maly, or Little Caucasus, to join the Kura valley. South of the lower Kura the Lenkoran, or Talish Lowland, extends between the Talish Mountains and the shores of the Caspian Sea.

The landscape of the Armenian Highlands is wonderfully varied. A large part of the surface is composed of erupted volcanic rocks, in places weathered into fantastically shaped columns and obelisks up to 25 feet in height, each bearing a boulder perched precariously on top. These boulders were shot out like shells from volcanoes of the Quaternary period,

and the ground around them has since been removed by weathering. There are a number of mineral springs, and numerous lakes formed by the damming of streams by lava flows, and completely surrounded by high mountains and plateaux. The plateaux are frequently dissected by deep

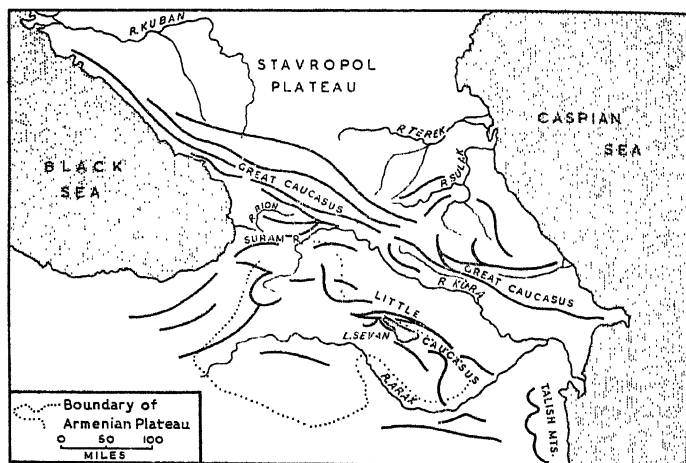


FIG. 50. THE CAUCASUS: RELIEF

ravines, the slopes of which are often covered with red-brown lava and volcanic ash.

Transcaucasia falls into four main physical regions: (1) the Black Sea coast and the Rion valley; (2) the eastern valleys of the Kura and the Arax and some of their tributaries; (3) the Lenkoran Lowland; (4) the mountains and plateaux of Armenia.

The Black Sea coast south of Tuapse (known as "Kholkhiz") and the Rion valley are favoured by mild, usually frostless winters and hot, damp summers. The soils are predominantly of the red laterite type, and precipitation is abundant. Hence the vegetation, sub-tropical in character, is both profuse and varied (see Chapter IV), and includes

valuable timbers on the forested hill slopes. The rivers fall swiftly from the mountains and form large areas of marsh and alluvial deposits on the lowlands.

The Black Sea coastal lands and the lower hill slopes and plateaux which overlook them specialize in the cultivation of

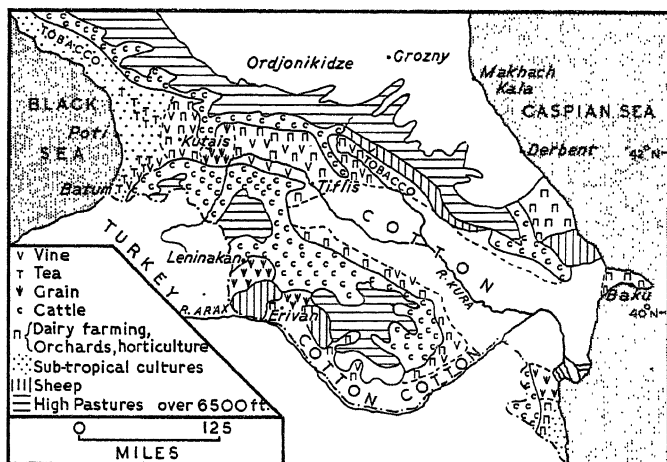


FIG. 51. THE TRANS-CAUCASUS: LAND UTILIZATION

citrus fruits, tea, and tobacco. Maize and wheat are the chief grain crops. Viticulture, orchard cultivation, and the growing of grain are the most important agricultural occupations in the Rion valley (Fig. 51).

Before 1917 most of the best land was sown to maize, and as in modern Italy, this was the staple food of the people. To-day tea is of far greater importance. Adjaria alone produces almost the entire tea-crop of the Soviet Union. Mature, well-planted plantations give a yield of about 5 cwt. of dried tea per acre. The large acreage now devoted to tea is shown by the output in 1938 of 6400 tons.¹ (The output expected for 1941 was 12,500 tons.)

¹ In Adjaria and the sub-tropical region of Azerbaijan there were, in 1939, about 135,000 acres of tea-plantations.

Adjaria also produces about 220,000,000 citrus fruits a year—70 per cent. of the citrus fruit crop of the U.S.S.R. Great care has to be taken to protect the trees against occasional light frosts during the winter (see p. 202).

Enormous oil-burners are placed among the trees; at the approach of frost they are lit, and spread a pall of dense black smoke over the plantation.

The Colchis, or Kolkhiz, marshes, well known in the days of ancient Greece, now form one of the most productive regions of the Caucasus. Large areas of marsh have been reclaimed, so that to-day these lands support flowering gardens, orchards, and plantations, amid the thick forests.

In Georgia, and especially in Adjaria, tobacco and the mulberry are cultivated on a large scale. About 18 per cent. of the silk produced in the U.S.S.R. is derived from Georgia, as well as large quantities of excellent tobacco.

In the mountain districts cattle-rearing is the chief occupation.

In contrast to the warm, damp climate of the Black Sea coast and the Rion valley, more continental conditions prevail in the eastern lands of Transcaucasia, shut off by the Suram Mountains from the influence of mild, damp air from the west. Owing to the southerly situation the winters are not severe, except in the mountains and plateaux. But in the valley lands there are more frequent frosts than in the west. The summers are exceptionally hot, and since the precipitation is very low, the vegetation of the plateaux and valleys is mainly of the steppe type, with considerable 'solonetz' formation (see p. 115). The summer is so dry that the green grass of spring withers and fades, only reviving again when the rains fall in the autumn. The steppe lands between the lower Kura and Arax are particularly arid.

Wheat and barley are grown for local consumption. Orchards and vineyards flourish in the lower lands, and large tracts of the dry steppe near the Kura river are used for the cultivation of cotton. The lower lands of Azerbaijan enjoy particularly favourable climate conditions for the growth of long-staple Egyptian cotton. The summer temperature is

high and the frost-free period long. Where necessary the land is irrigated. To-day Azerbaijan is one of the main cotton-producing regions of the U.S.S.R. Smaller areas of irrigated land are devoted to rice cultivation.

In the mountains and plateaux of Armenia and the upper valley of the Arax the winters are very severe, while the summers are very hot. Precipitation is light or moderate according to the height and orientation of the land. The mountain slopes generally enjoy sufficient precipitation to support forests, while the plateaux and the country on either side of the Arax river is mainly open steppe land, dissected by canyon-like ravines, and in many parts supporting enormous fields of golden grain. Here and there are pleasant red-tiled villages, and the houses, with their high red roofs, wide windows, balconies, and gardens, offer a strong contrast to the rather gloomy stone villages in the mountains of Southern Armenia.

For centuries cattle- and sheep-rearing have been the most important means of livelihood for the people in the drier parts. In the past fodder grasses were rarely grown. The herds were driven up to the high Alpine meadows during the summer and brought back to the lower lands for the winter. But the disproportionate distribution of winter and summer pasture often made it necessary to drive the cattle long distances. Cattle-rearing was, therefore, a nomadic occupation.

Fodder grasses, especially lucerne, are now cultivated on irrigated lands near the rivers, and the old nomadic way of life has been superseded on large farms by intensive cattle-breeding for meat, milk, and cheese. Wheat and sugar-beet are grown on the Leninakan and Loriisk steppe.

The irrigated lands of the Arax valley and the arid Ararat region support vineyards, orchards, and tobacco- and cotton-plantations. In 1938 Azerbaijan possessed 343,900 acres of cotton-plantations, and the production of cotton was exceeded only by the republics of Soviet Central Asia.

The Talish Mountains rise to the east of the lower Arax, and between them and the Caspian Sea lies the Lenkoran Lowland. Here the climate is very similar to that of the

Kholkiz Lowland, near the shores of the Black Sea. Atmospheric moisture is condensed by the mountains so that the precipitation is fairly heavy. The winters are mild and the summers hot.

The contrast between the forested eastern slopes of the Talish Range and the productive coastal plain on the one hand, and the dry, treeless western slopes, affords a clear illustration of the important part which these mountains play in the geography of this region. The forests contain valuable timbers such as ironwood, while citrus fruits, and tea, kenaf, rami,¹ and other industrial crops are cultivated on the lowland, which constitutes the second most important region for the production of sub-tropical cultures in the U.S.S.R.

Industries

Although coal is mined at Tquarchelly and Tquibuli² in Georgia, and the oil-wells of Baku are among the most important in the world, it is probably true to say that hydro-electric power is the key to the industrial development of Transcaucasia.

Electricity is needed not only for industrial production, but also for railway transport, in order to solve the problem of carrying heavy loads over the steep gradients of the high mountain passes, to pump water to higher levels in irrigation works, and to operate suspended rope-railways which transport valuable timber and minerals from the more remote mountainous areas.

Many of the dams built at hydro-electric stations provide reservoirs of water which are used to irrigate the land. The reserves of water-power are tremendous, for the rivers of Transcaucasia fall considerable distances as they flow from the highlands to the lowland plains. Estimates put the total power reserves at three million horse-power.

The situation of the largest hydro-electric stations is shown in Fig. 52. One of the most powerful—it has a capacity of

¹ See p. 214.

² The output of these mines is now about 1,500,000 tons.

37,000 kilowatts—has been built by the river Kura, near Tbilisi. Another important power station utilizes the waters of the river Rion, near Kutaisi, to produce electricity for the Poti-Tbilisi Railway. Altogether there are more than 200 hydro-electric stations in Caucasia, and of these 148 are in

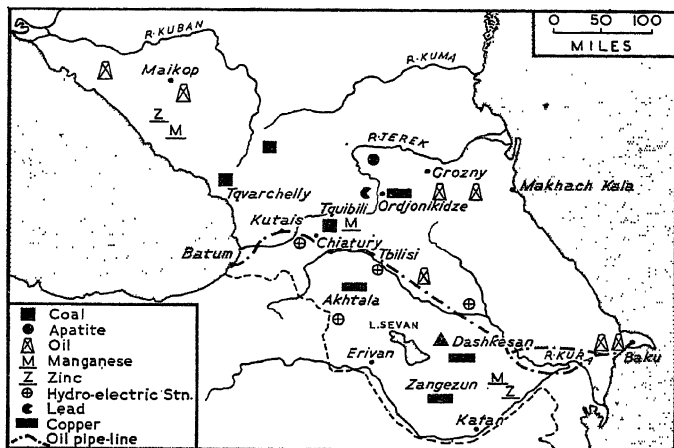


FIG. 52. THE CAUCASUS: INDUSTRIAL RESOURCES

Georgia, Azerbaijan, and Armenia. The aggregate annual output of Armenian hydro-electric stations alone was 350,000,000 kilowatt hours in 1939.

The most ambitious system of hydro-electric works is designed to utilize the waters of Lake Sevan, situated in Armenia, more than 6000 feet above sea-level, in a giant saucer-shaped depression amid the mountains. The level, and consequently the surface area, of the lake has been reduced in order to limit evaporation. Previously, although a great deal of water flowed into the lake, one river, the Zanga, was sufficient to carry the water which flowed out. To-day there is enough water available not only to operate hydro-electric stations, but to irrigate 200,000 acres of

arid plains around the lake, where cotton, the vine, and fruit are grown. At present two power stations are in operation, one at Gyumush (250,000 kw.) and the other at Kanakirsk (88,000 kw.). Eventually six more will be constructed, one below the other, at intervals along the river Zanga, and having a total capacity of 2,400,000,000 kw.h. per year.

Transcaucasia possesses immense sources of wealth other than water-power. The country is extraordinarily well endowed with minerals, of which oil is of paramount importance. The chief wells are in the Aspheron Peninsula, near Baku, where the first wells were sunk in 1871. The oilfield of this region yields about one-half of the total output of the U.S.S.R. and possesses about one-half of the total reserves of petroleum. There are other wells in the Shirak steppe, in Georgia.

Considerable quantities are shipped across the Caspian to Astrakhan, and thence up the Volga to the various refining centres. Two pipelines, one carrying kerosene, the other petroleum, run from Baku to Batum, the main centre for the foreign export trade. There are refineries both at Baku and Batum, and together they have a capacity of 18,500,000 tons a year. The Baku, Maikop, and Grozny oilfields together yield about 30,000,000 tons of crude oil each year, representing 85 per cent. of the total output of the U.S.S.R. Transcaucasia contributes about 75 per cent. of this amount.

The Soviet Union produces 15 per cent. of the world's oil. The actual reserves in the Caucasus and elsewhere are greater than those of the U.S.A. and form about one-third of the total known resources in the world. But it is significant that only 29 per cent. of the Soviet reserves lie within the Caucasus. Thus there is likely to be a very great development of those new oilfields which have only recently been brought into production in the Urals, near the middle Volga, and on the northern shores of the Caspian.

In spite of an increase in the output of crude oil from 11,700,000 tons in 1928 to 34,700,000 tons in 1940, the export declined from 6,200,000 tons in 1934 to only 500,000 tons in 1940. This was due to the enormous increase in home

consumption. There were fourteen times as many tractors in use in the Soviet Union in 1938 as there were in 1928, and between 1930 and 1940 the number of motor vehicles on the roads rose from 57,000 to 810,000.

At Sungait, to the north of Baku, the by-products from the oil-refineries are utilized for the production of chemicals and synthetic rubber. There are also large factories at Erivan engaged upon the manufacture of the latter commodity from calcium carbide. Armenian limestone, and coal from the mines at Tquarchelly and Tquibuli, in Georgia, are used for the production of calcium carbide. In addition to these raw materials, large quantities of electric power are required. In order to produce one ton of rubber as much electric power is required as is necessary to produce a ton of aluminium. Hence the importance of the Lake Sevan hydro-electric stations, described above.

Almost as important as oil are the deposits of manganese found in Georgia, near Chiatyry. The ores, which contain over 60 per cent. of metal, are used to harden steel. The U.S.S.R. possesses 73 per cent. of the world reserves of manganese, and approximately two-thirds of the amount produced in the Soviet Union in 1937 (1,650,000 metric tons) came from the Chiatyry mines. The ore is refined near the mines, and also at Poti. It is then sent to the chief metallurgical centres, particularly to those in the Urals. New deposits have been discovered at Labino and Maikop. Although high-quality magnetite iron ore is mined and smelted at Dashkezan, in Armenia, and iron and steel are produced at Tbilisi in order to supply the engineering works, the ferrous metallurgical industry is still in the early stages of development and cannot be compared with that of the Urals, or other large centres of heavy industry. The production of copper, on the other hand, is of national importance. Armenia produces about one-eighth of the copper mined in the U.S.S.R. There are mines near Dashkezan, and the refineries and smelting works at Allahverd and Kafan, in Armenia, produce 10,000 tons annually. There are other deposits of this ore at Akhtala (south of Tbilisi), and in the Tchorokh valley in Southern Adjaristan,

while the mines at Zangesun, close to the Iraq frontier, have been worked since Biblical times. The word 'Zangesun' means 'sounding brass.' Zinc and lead are also mined in Transcaucasia (*e.g.*, at Sadon). At Kutaisi there is a recently established chemical industry which specializes in the production of nitrogen fertilizers.

In addition to the industries which depend upon mineral resources there are many others concerned with the manufacture of agricultural products—fruit-preserving and -canning, meat-packing, and cold-storage, tobacco- and tea-manufacturing, the textile industry (cotton and silk), and the timber industry.

The chief cotton-mills are at Leninakan, Baku, and Kirovobad. The Leninakan spinning and weaving mills produced more than 100,000,000 yards of cotton fabric in 1937. Silk spinning and weaving is carried on at Kutaisi, Nukha, and Tbilisi. In the latter town woollen and knitted goods and other articles of clothing are also manufactured, as well as chemicals, films, vegetable oil from cotton-seed, and margarine. There are also important engineering works engaged in the construction of machinery for the oil industry. At Erivan, in addition to the synthetic rubber works mentioned above, there are tanneries and clothing and tobacco factories.

The factories of Adjaria use the produce of the local plantations for the manufacture of tea and tung oil, and there are also engineering works where machinery for these industries is constructed.

Fruit and vegetables are preserved and canned at Erivan and Batum. In 1940 Armenian canneries produced 20,000,000 cans of fruit and vegetables. The Batum factories specialize largely in the preserving of citrus fruits. They deal with more than 40,000,000 fruits a year.

The importance of the timber industry lies in the great variety of deciduous trees which are available for use—oak, beech, maple, chestnut, ironwood, box, and others, in addition to coniferous trees. Paper-mills are situated at Ingur, on the river Ingur, in Abkhazia, and there are saw-mills, paper-mills, and furniture factories at Tbilisi.

POPULATION AND COMMUNICATIONS

Since ancient times the central geographical position of the Caucasus, lying astride a historic trade route between Europe and the East, has profoundly influenced the character of its population. All the ancient empires strove to control the Caucasus. The soldiers of Rome, Byzantium, Mongolia, Persia, Arabia, and Turkey fought each other there, attempting to secure domination of the fertile Rion and Kura valleys and lowlands—the gateways to the pass across the Suram Mountains, and the key to the route between the shores of the Caspian and the Black Sea. Georgia had a flourishing culture and civilization of its own more than two thousand years ago. The Caucasus, and particularly the Colchis Lowlands known to Greek mythology in the stories which describe Jason's adventures in his search for the Golden Fleece, were renowned for their wealth. The Greeks established colonies on the shores of the Black Sea, and Alexander the Great occupied the Caucasus on his way to the borders of India. The mountains form a barrier between the steppe lands to the north and Persia in the south, and in order to secure their northern frontiers the Persians invaded Transcaucasia and founded the town of Tbilisi (Tiflis) during the fourth century. It was also during this century that Christianity was first introduced, while some three centuries later the Arabs introduced the Moslem religion.

The Turks eventually displaced the Arabs as the dominant force in the Caucasus, and by taking advantage of their difficulties during the Crusades the Georgians achieved their independence and established a kingdom from the Black Sea to the Caspian.

From the sixth century onward nomadic tribes from the north had continually raided and plundered the rich valleys, and by the thirteenth century the Tartar conquest of Georgia finally destroyed the national unity of that kingdom.

During the sixteenth century the Caucasus was the scene of the struggle made by the Turks to establish their supremacy over the Persians.

Finally the Cossacks—originally peasants who had fled from the terrible conditions of serfdom in feudal Russia—came to the lands of the Terek and Kuban. They were used by the Tsar during the Russian conquest of the Caucasus during the nineteenth century, when Russian penetration, which had commenced in the time of Peter the Great,¹ was carried forward ruthlessly. The Georgian military highway, linking the Pre-Caucasus with Transcaucasia, was built in 1804. By the end of the century the Caucasus belonged to the Tsars, and its colonization proceeded rapidly.

It is not surprising, therefore, that from these human tidal waves which swept across the region, a 'wash' consisting of more than forty different national groups should have been left behind.

In Transcaucasia the greater part of the population to-day consists of groups of Turkic, Mongol, and Indo-European origin. To the latter group probably belong the Georgians,² as well as the Svani, Meritini, and other peoples, the Armenians and Iranians (Ossetians, Kurds, and Talish peoples), and the inhabitants of the mountainous districts—the Adygei, Abkhazi, Karbardino, Chechen, and Daghestan peoples. The Georgians and Armenians form two of the largest national groups—about 3,500,000 and 1,250,000 respectively. The former comprise 31 per cent. of the peoples of Transcaucasia and the latter 23 per cent.

The Ossetians form an interesting national group. Their language is predominantly Aryan, and they have blue eyes and fair or light-brown hair. It is probable that they are an ancient Germanic people which migrated into Southern

¹ "The first regular army trained on modern European lines to operate in Caucasia was transported by sea from the mouth of the Volga to the Terek, and Peter, with no great difficulty, occupied all the country as far as the Khanate of Kuba to the north of Baku."—W. E. D. ALLEN, *op. cit.*

² The actual origin of the Georgians is obscure. Their language seems to be unrelated to other main linguistic groups, and is known as Japhetic. Armenian contains both Japhetic and Indo-Aryan elements. W. E. D. Allen, in his article on "The Caucasian Borderland" (*op. cit.*), writes, "There are no very marked physical differences between the various peoples of Asia Minor and the Caucasian isthmus." He considers that the type native to these parts is Alpine.

Russia and were subsequently driven by nomadic invaders into the hills where they now live. There are also about 10,000 Germans in the Caucasus, the descendants of members of religious sects which left Germany in the seventeenth century.

The Turkic and Mongol peoples came originally from the



FIG. 53. THE CAUCASUS: ADMINISTRATIVE REGIONS

north-east, across the Caspian Sea. The inhabitants of Azerbaijan form the largest Turkic group (3,300,000), while the Mongols are represented by the Kalmucks, who dwell in the Pre-Caspian dry steppe country.

From the time when Caucasian unity was destroyed by the Tartar invasion until the establishment of the Soviet regime there was constant bloodshed and strife, brought about both by attempted domination from outside and by bitter fighting amongst the various national groups.

The Armenians in particular suffered terribly from the policy of "Anti-Armenianism" introduced during the period

of Turkish rule, extended when Russia obtained control of Armenia at the end of the nineteenth century and carried to another high level of atrocity when the Turkish Government began the mass-deportation of Armenians from Turkish Armenia during the Great War. Many thousands perished, and by 1918, as a result of massacres, deportation, revolution, and war, nearly half of the Armenians had been destroyed.

Friendly relations between Turkey and the U.S.S.R. have been maintained since 1921, and the system of Soviet republics, autonomous republics, autonomous provinces and national regions within the Caucasus, together with the granting of a large degree of economic autonomy, and complete cultural autonomy, to the various national groups, has at last brought peace, unity, and economic well-being to the peoples of this part of the Soviet Union—a magnificent achievement when one considers the problems involved in the development of the culture of only one community—the people of Daghestan. Here there are eighty-one different national groups, speaking 320 languages or dialects.

To-day the Caucasus is the proud possessor of forty-one higher educational institutions, with 40,000 students. In Azerbaijan, to take a particular example, there are more than thirty-six schools, with over 700,000 pupils.

Since the majority of the people are Georgians, Armenians, and Azerbaijanians, the territory of Transcaucasia has been divided into three Soviet Republics—the Republics of Georgia, Armenia, and Azerbaijan. The smaller national groups possess their own territories within these republics (Fig. 53).

In the lowlands of the Pre-Caucasus 90 per cent. of the population is either Russian or Ukrainian. When the Russians conquered these lands the native Cherkess, Adygei, Kabardino-Balkari, etc., were driven into the foothills and the mountains, where to-day they possess their own autonomous districts and republics.

The population of Caucasia is most dense in the damper fertile valleys, particularly in the Rion and middle Kura valleys, and also along the coast of the Black Sea, where such a large proportion of agriculture and industry is concentrated.

The drier eastern lands and the mountainous districts are sparsely peopled. An exception is the Erivan Plateau, where there is a considerable concentration of Armenian population.

About 18,000,000 people live in the Caucasus, and of this number about one-third are town-dwellers. More than half of the entire population is found in the valleys of Transcaucasia, and here a high proportion of the people is engaged in agricultural occupations. In the Pre-Caucasus about one-fifth of the total population is concentrated in ten towns.

Apart from the larger industrial towns, the population of which is given below, there are several fairly large health and pleasure resorts, such as Kislovodsk and Sochi in the Caucasian foothills, or in the 'Soviet Riviera' on the Black Sea coast.

The mineral waters and spas of the Caucasus are well known throughout the U.S.S.R. There are hundreds of natural mineral springs—more than a hundred in the district around Pyatigorsk alone. The Narzan waters of Kislovodsk, renowned in fable and song many centuries ago, are to-day bottled and sold in street kiosks in almost every Soviet town!

The great increase in industrial activity which has occurred within the last ten or fifteen years is reflected in the increase in the population of the larger industrial towns. This is indicated in the table given at p. 488.

The three largest towns, Rostov, Tbilisi, and Baku, each have a population greater than half a million. Baku, the centre of one of the most important oil-producing regions in the world, is the chief port on the Caspian Sea, a sea which carries more than 35 per cent. of all Soviet shipping tonnage. It is an ancient town of Persian origin, founded in the fifth century. (Baku is a Persian word, meaning "City of the Winds.") To-day it is a large modern city, the fifth largest in the Soviet Union, with tall modern buildings, blocks of flats, factories, offices, boulevards, and gardens. Grey hills and plateaux rise behind the town, dotted with brown stone houses with flat grey roofs. It is connected by rail with the great grain port of Novorossisk.

THE POPULATION OF THE CAUCASUS (1939 CENSUS)

AREA	TOTAL	URBAN	RURAL	CHIEF TOWNS	1939 POPULATION AS PERCENTAGE OF 1926
THE PRE-CAUCASUS (included within the R.S.F.S.R.):					
Rostov Region (N. Caucasus)	2,894,038	1,263,097	1,630,941	Rostov-on-Don Taganrog . 510,253 Novorossiisk . 188,808 Maikop . 95,280 Pyatigorsk . 67,302 Kislovodsk . 62,875 Krasnodar . 51,269	.... 165.6 218.4 140.2 136.9 154.6 197.9
Krasnodar Territory (Including the Adygei Autonomous Province)	3,172,885 241,773	764,844 67,302	2,408,041 174,471	Krasnodar . 203,946	.... 136.0
Ordzhonikidze Territory	1,949,340	394,469	1,554,871	Grozny . . 172,468	.... 177.6
(Including: Cherkhass Autonomous Province Karachai Autonomous Province)	92,534 149,925	281,646 10,623	603,888 139,302		
Kabardino-Balkar A.S.S.R., N. Ossetian A.S.S.R., Chechen-Ingush A.S.S.R.	359,286 328,885 697,408	84,662 154,851 198,669	274,574 174,034 498,739		
Daghestan A.S.S.R.	930,527	196,480	734,047	Makhach-Kala 86,847	.... 238.8
Total (Pre-Caucasus)	10,332,319	3,057,072	7,275,247		
TRANS-CAUCASIA					
Georgian S.S.R.	3,482,289	1,006,560	2,475,729	Tbilisi . . 519,175 Kutaisi . . 81,479 Batumi . . 70,607	.... 176.6 162.0 146.1
Armenian S.S.R.	1,281,599	366,416	915,183	Erivan . . 200,301 Lennakan . . 67,707	.... 309.6 160.0
Azerbaijan S.S.R.	3,209,727	1,160,723	2,049,004	Baku . . 809,347	.... 178.5
(Including the Autonomous Republic of Nakhichevan and the Nagorny-Karabakh Autonomous Province.)					
Total (Transcaucasus)	7,973,615	2,533,699	5,439,916		
Total (Caucasus)	18,305,934	5,590,771	12,715,163		

Tbilisi, another town of ancient origin, and the capital of the Georgian Republic, stands astride the historic route from the Caspian to the Black Sea, across the Suram mountains, followed to-day by an electric railway. It is also the terminus of the military highway which crosses the Caucasian mountains from Ordzhonikidze.

Rostov-on-Don, the administrative centre for the North Caucasus, is placed at the gateway to the entire Caucasian region. It lies between the rich black earth lands of the Ukraine and the fertile grain lands of the Don-Kuban country. To the north is the industrial region of the Donetsk valley, and to the west lie the iron-mines of Taganrog.¹ It is a focal point of communications between Moscow, the Ukraine, Stalingrad, and the Volga on the one hand, and the Caucasus on the other, besides being a port near the mouth of the Don, having access to the Black Sea. Its importance will be further increased by the completion of the Manych-Kuma and Don-Volga Canals (see p. 464).

The significance of Rostov's geographical position is reflected in its history. After the devastation of the ancient Greek colony of Tanais (situated near the modern town of Azov) by the Huns, the entire area between the lower Don and the Azov Sea remained uninhabited until Russian settlers made their way to this region during the eighteenth century.

The favourable position of the lower Don valley—lying close to the Volga, which gave access to the Urals and Central and Northern Russia, on the one hand, and close to the Caucasus and the Black Sea on the other—gave it considerable advantages as a centre for trade between Russia and the Mediterranean lands. Numerous commercial settlements sprang up close to the river Don.

In 1761 a fortress was built on the high left bank, named after St Dmitri of Rostov (the seat of the ancient principality

¹ Taganrog, a port on the Sea of Azov of a similar size to Southampton, was founded two hundred years ago and became an important South Russian trading centre. In the middle of the nineteenth century the harbour became shallow and the port declined. Since 1917 it has revived as a metallurgical centre.

near Moscow) and later named Rostov-on-Don in order to distinguish it from the older town. In 1779 Armenians were permitted to settle near Rostov-on-Don, and founded Nakhichevan, which eventually merged with its neighbour into a single city.

Batum, the best port on the eastern Black Sea coast, lies at the southern end of the fertile Kholkiz region, in a countryside where the palms and luxuriant vegetation are reminiscent of Florida.

Before the unification of Georgia as a kingdom this region was the scene of many historic battles. The Romans warred with the Persians here, and during the Byzantine period a fort was built not far from Batum. The great Georgian queen, Tamara, built a fort in the twelfth century, while in 1564, when Turkish power held sway, a citadel was built near the town.

During the Russo-Turkish War (1877-78), when the Russians came to Batum, it was a village of some 3000 inhabitants, surrounded by marshes and forests. During the next eighty years, partly owing to the fact that Batum Bay was one of the best harbours on the Black Sea, the village grew into a town and became a great Russian port through which trade passed between Europe, Persia, Transcaucasia, and Central Asia. In 1883 a railway was constructed, connecting Batum with the main line from Tbilisi to the rest of Russia. In 1886 the first oil-transporting ships appeared in the harbour, and its future commercial prosperity was assured. To-day Batum is an exceedingly pleasant city. There is practically no winter, while south-west winds bring relief from the heat of summer. It is a city where dust and fogs are unknown, where the atmosphere is so transparent that the majestic peaks of the Caucasus are often clearly visible. The marshes around the city have been drained and the town has been almost entirely rebuilt within the last twenty years. The open squares, white stone houses with large windows, balconies, vines clinging to the walls, and gardens and trees surrounding them, give the town the appearance of a health resort.

The Caucasus region is traversed by two main routes, important since ancient times for trade from Iran and the East, across the Caspian Sea to Europe. One route follows the Caspian shore around the eastern edge of the mountains to Makhach-Kala, then turns north-westward across the Pre-Caucasus Lowlands. The other, 560 miles long, follows the Kura valley, crosses the Suram Mountains, and descends to the Rion valley and the Black Sea coast. Both these routes are followed by main railway-lines, which, together with branch lines, and another main line along the Arax valley to Erivan and then across the mountains to Leninakan and Tbilisi, give access to the most developed agricultural and industrial regions of the Caucasus. From the latter line two lines branch off to the south, to Turkey and Iran respectively. Large sections of the main lines have been electrified, an important factor if they are to be utilized to carry heavy loads of agricultural and industrial products over high passes, and the mountains of the Caucasus do not possess many easy routes (see frontispiece). Within recent years the building of a very important railway, which will be the only one to cross the main Caucasian Ranges, has been planned between Tbilisi and Ordzhonikidze, and construction may possibly have commenced. From Batum, a new coastal railway to Tuapse is partly completed, and will eventually continue to Novorossisk, already linked with Batum by an excellent highway. But in spite of the network of railways described above, large areas are still not served by this means of transport. This deficiency has been overcome by the construction of motor roads. Some of them, such as the military highway from Ordzhonikidze to Tbilisi, are of great strategic value.

Finally, communication with the other parts of the Soviet Union will be facilitated by the completion of the Don-Volga and Manych-Kuma Canals. The latter, which will eventually establish direct communication by water between the Black Sea and the Caspian, has already been partially constructed, and in 1938 it was possible for ships to sail for 200 miles up the Manych. When the Don is connected to the Volga the whole of the Caucasus will have access to the Black Sea, the

Caspian Sea, and, by way of the Volga, to a large part of the lands of European Russia.¹

Oil and manganese are exported from the Caucasus abroad and to all parts of the U.S.S.R. The Novorossisk cement industry supplies many distant regions. The north Caucasian plains constitute one of the chief Soviet granaries. Across the Caspian various cargoes come from Central Asia. Hence we cannot underestimate the importance of a good transport system both within the Caucasus, and between that region, the Soviet Union, and the rest of the world.

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The Crimea

The Crimean Peninsula lies between the Caucasus and the Ukraine, being separated from the former by the narrow Kerch Strait and Kerch Isthmus, and from the latter by the Perekop Isthmus. The steppe plains of the north, the Kerch Isthmus, the Crimean Mountains, and the narrow coastal plain in the south form four natural regions.

The extremely level and low-lying steppe plains occupy more than three-quarters of the total area of the Crimea, and form a continuation of the Ukrainian steppe. The climate is continental and extreme. In winter cold dry winds from the north sweep over the plains, removing the thin cover of snow from the frozen ground. The summer is dry. Precipitation is very slight. Hence these steppe lands are particularly dry and waterless, and the farmers have to rely almost entirely upon artesian wells and the melting snows of spring to moisten the soil.

This is essentially a grain and tobacco region, wheat and barley being the main crops. Some of the best types of Russian tobacco are grown here, and recently the cultivation of cotton and fruit has been introduced.

¹ "It is worth emphasizing that a large proportion of Transcaucasian traffic is transmarine. It is estimated that 40 per cent. of Soviet internal trade passes across the Black Sea and the Caspian Sea and over the internal waterways of Russia. . . . The two marine basins . . . have the same importance in the economy of the U.S.S.R. as the Great Lakes have in Canadian and American economy."—W. E. D. ALLEN (*op. cit.*).

The Kerch Peninsula consists of several low hills and ridges. Oil and natural gases are found, in addition to vast deposits of good-quality iron ore.

The Crimean Mountains are composed largely of limestones. They divide into three ranges in the west, and of

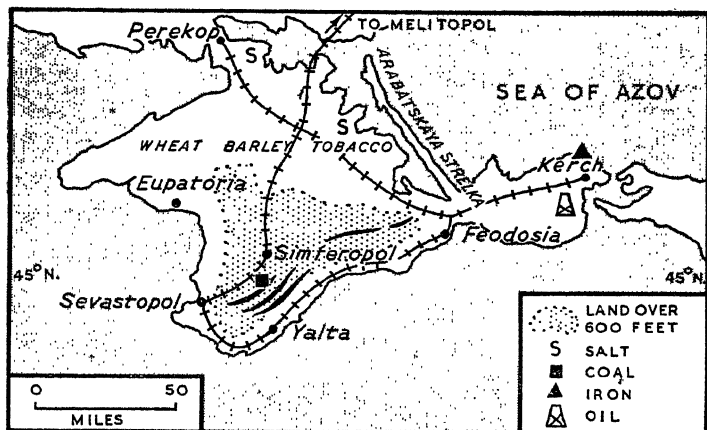


FIG. 54. THE CRIMEA

these the central range has been considerably denuded and eroded by river action, so that the land is often dissected into separate plateau blocks. The hard grey limestones of the southern ridge have been less eroded, and consequently the elevation is higher and the mountains fall in a steep faulted edge to the coastal plain. The drier mountain and plateau pastures support flocks of sheep. The wetter mountain slopes, particularly those facing south, are forested. Horticulture, viticulture, and tobacco cultivation are carried on in the valleys.

The fourth region, the narrow coastal plain of the south, stands in contrast to the rest of the Crimea. Its width varies from just over a mile to more than six miles. In places it is broken by limestone bluffs, protruding towards the sea from

the mountains, or by outcrops of volcanic rocks. The mountains screen the coast from the cold northerly winds of winter, and at the same time limit to the coastal plain the penetration of mild damp air from the south. The climate is of the Mediterranean type, with mild winters and clear, rainless, sunny summers. The natural vegetation is also Mediterranean in character, including such trees as the olive, cypress, laurel, cork-oak, etc. The dark green forested hill slopes, broken here and there by the white-stone buildings of sanatoria or holiday resorts, overlook fertile tobacco plantations, orchards, and vineyards (*e.g.*, the famous Massandra vineyards).

From these rich and fertile plains the land falls steeply to the sea.

Industry

The most useful minerals found in the Crimea are salt, near Perekop, phosphoric iron ore (the second largest deposits in the U.S.S.R.) at Kerch, where there are mines and iron- and steel-works, sulphur, and various salts from lakes. Although some coal is mined in the south, the Don basin coalfield supplies most of the fuel used in the metallurgical industry. Waste products from this industry are used in the manufacture of chemicals. (One of the most important products of the chemical industry is phosphatic fertilizer.) Salt is obtained from the shallow Sivash firth in the north, and building stone from the mountains in the south.

The second important group of industries is engaged in the preserving and canning of fruit and vegetables and the manufacture of tobacco.

Population

In ancient times Phoenicians, Greeks, and Romans came by sea and established trading colonies on the Southern Crimean coast. In the Middle Ages Genoese, and later Turks, founded colonies there. Finally the entire peninsula was taken by Russia at the end of the eighteenth century.

The present population (1,126,824) consists chiefly of

Russians and Ukrainians. Tartars form 28 per cent. of the inhabitants, and in the towns there are Bulgarians, Germans, Jews, Greeks, and Armenians.

The greater part of the Crimea is included within the dry steppe plains of the north, where agriculture is of the extensive, mechanized type, and the density of population consequently not high. About 48 per cent. of the people of the Crimea live in towns, and are engaged in trade and commerce, in the industries described above, or working at the health and pleasure resorts in the south.

Feodosia, Kerch, and Eupatoria are small ports which export wheat, iron ore, and salt respectively, to European Russia. There are tobacco factories at Feodosia. Kerch, with a population of more than 100,000, is the centre of the mining and metallurgical industries.

Sevastopol (111,946) possesses an excellent system of docks and ship-repairing yards, as well as a fine harbour. It is an important naval base, guarding the entrance from the Black Sea into the Southern Ukraine and the Caucasian coast. Simferopol (146,678) is the administrative and transport centre of the Crimean Republic. Fruit- and vegetable-preserving works are situated here. Yalta is the largest health resort on the south coast, the 'Soviet Riviera.'

The Crimea is served by a good system of railways, and a number of excellent modern motor roads.

BIBLIOGRAPHY

Russian

Articles published in "Nasha Strana" (Moscow)

- N. DOBICHIN: "Perekop," in No. 6, 1939.
E. MURZAYEV: "Through Sunny Taurida," in No. 6, 1939.
U. ZHUKOV: "Dawn in Kholkiz," in No. 6, 1939.
N. VERZHIBITSKY: "The Azerbaijan Subtropics," in No. 7, 1939.
G. YUREV: "A Month in Armenia," in Nos. 10, 11, 1939, and No. 1, 1940.
E. VOROBYEV: "Batum," in No. 12, 1939.
U. ZHUKOV: "Tbilisi-Tiflis-Tbilisi," in No. 8, 1939.

Agriculture in Mountain Daghestan (the Academy of Sciences of the U.S.S.R., Moscow, 1939).

V. C. KLUPP: "Transcaucasia (Moscow, 1927).

English

W. E. D. ALLEN: "The Caucasian Borderland," in *Geographical Journal*, vol. xcix, Nos. 5, 6, May-June 1942.

L. VOLIN: "The North Caucasus—a Russian Granary," in *Foreign Agriculture*, No. 7, 1942.

The Ukraine and the Western Border Lands

The Ukraine

THE Ukraine occupies a large and important section of the East European Plain, which continues farther to the south and south-east in the Crimea and North Caucasus. It is one of the most densely populated regions of the Soviet Union, being favoured by a relatively mild climate, fertile black soils, and great mineral wealth. The climate of the Eastern Ukraine is markedly more continental than that of the west. The winter is colder, the summer hotter, and precipitation lighter. In the west the spring comes earlier and the autumn is longer and warmer. Rain falls chiefly in spring and early summer, a distribution which is favourable to agriculture, especially the ripening and harvesting of grain. In the drier eastern lands on the left bank of the Dnieper thunderstorms and heavy downpours of rain are common.

Precipitation decreases from north-west to south-east, and this is reflected in the change in the character of the natural vegetation from forest to wooded steppe and finally to true steppe. Everywhere, except in the extreme south, the sides of the valleys are wooded, and in depressions, where the ground water lies nearer the surface, as well as by the sides of streams, poplars, willows, alders, and osiers grow. Most of the steppe land is now under the plough.

The natural regions of the Ukraine, described below, are shown in Figs. 55 (*a*) and (*b*).

The northern forested, or "Polyessie," region includes a section of the great Polyessie Lowland of Byelorussia and the Western Region (see p. 516). It consists of very level plains in which bogs and marshes, sandy and podsolized soils, predominate. The climate is wet, and the natural vegetation is a mixture of coniferous and deciduous trees. Agriculture is mainly concerned with the breeding of dairy cattle on a

basis of meadow, sown grass, and potatoes. Rye and buckwheat are grown to meet local needs. In the south, where the vegetation begins to change from forest to wooded steppe, sugar-beet is the most important crop.

On the left bank of the Dnieper the land is slightly higher and rather hilly, and the climate less moist. There is clear evidence of glacial deposits—morainic material, and extensive tracts of fluvio-glacial sands. As in the western part of the Polyessie region, there are extensive forests. Hemp takes the place of potatoes, and the cultivation of this crop is second only to dairy farming as an agricultural occupation.

The countryside around the village of Novgorod Seversky, between Chernigov and Bryansk in the Desna valley, is typical of the left-bank region. The village, an old settlement dating back to the eleventh century, is situated on the hillside above the Desna, and is composed largely of neat wooden houses, with pumpkins and melons growing in the gardens. The village is surrounded by mixed deciduous and coniferous woods, and broad meadows where thousands of geese feed and herds of cattle graze. Fish are plentiful in the rivers, fishing being the occupation of numbers of local people, who work together in artels. The left-bank tributaries of the Desna flow through wide, mature valleys, where numerous peat-bogs provide raw material for several turfbriquette factories.

The wooded steppe zone enjoys much more favourable natural conditions—black soils, a warmer climate, and precipitation which is sufficient, but not too heavy, for the growth of a variety of crops (18 to 20 inches with autumn and winter maximum).

On the right bank of the Dnieper the land rises gently to the Volhynia-Podolsk Plateau. The climate is milder and damper than in the Dnieper Lowland on the left bank, where the winters are more severe, and towards the east the annual rainfall is as low as 12 inches. The spring rains are deficient and often irregular, while the downpours which occur in summer may seriously interfere with work in the fields.

The cultivation of sugar-beet, together with winter wheat

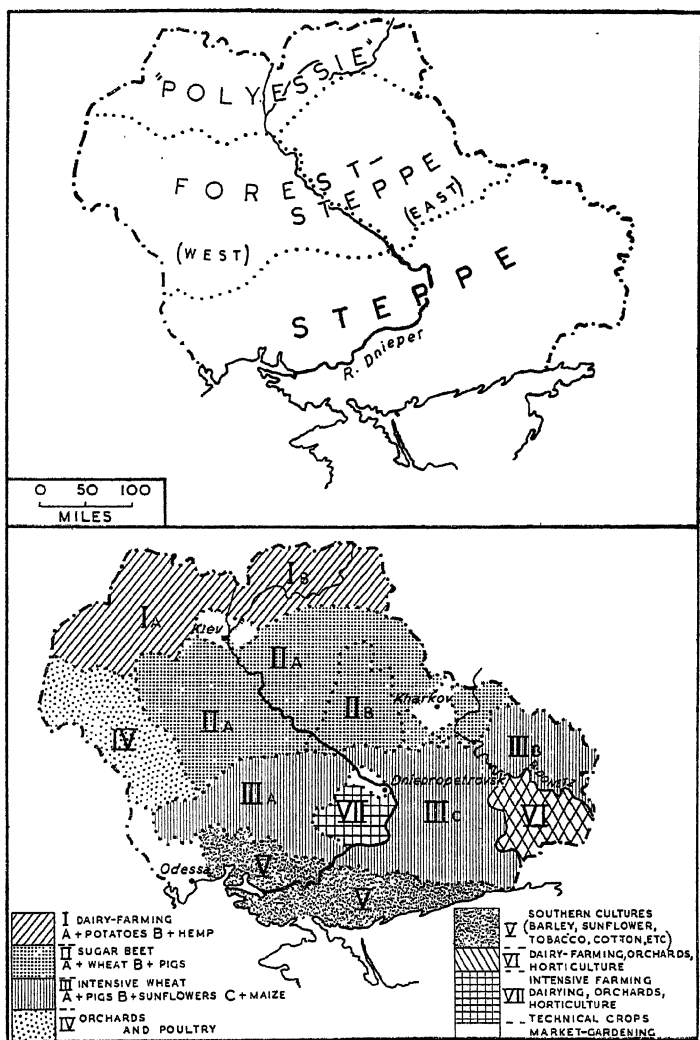


FIG. 55. THE UKRAINE: (a) VEGETATION REGIONS;
(b) AGRICULTURAL REGIONS

on the right bank, and pig-breeding and spring wheat on the left bank, are the most important agricultural occupations. Beet is grown as the main crop in a system of crop-rotation, since it prepares the soil for the following crop, which is usually wheat. Hence the higher the percentage of beet, the greater is the yield of grain, in spite of the acreage of the latter crop being smaller than in those regions of the Ukraine where grain-cultivation predominates. A greater proportion of the sown area is devoted to beet in the lands on the western side of the Dnieper than on the drier eastern side. Rye, barley, and oats are usually grown in addition to wheat. Finally, intensive cattle-rearing is assisted by the provision of fodder from the waste products of the beet sugar industry, which supplements the fodder crops—potatoes, sown grasses, etc.

In the Volhynia-Podolsk Uplands the ancient crystalline rocks of which they are composed come to the surface in some places. But generally they are hidden by a cover of sandstones, limestones, and clays, and in turn these are masked by loess deposits. As a result of the ease with which these deposits are eroded, the surface is dissected by steep-sided valleys, and ravines and gullies are common.

Apart from the main crops of sugar-beet and grain, bee-keeping and orchard cultivation are carried on everywhere in this region. The vine flourishes in the valleys, where the plants are protected from cold winter winds. In fact, the right-bank lands of the wooded steppe zone form one of the most beautiful as well as one of the most fertile regions of the Ukraine. The picturesque villages, with their thatched cottages surrounded by cherry-trees and orchards, are reminiscent of France. Woods and trees break the monotony of the ploughed fields, bringing variety to the landscape. The country has an abundance of dairy cattle, draught oxen, sheep, and pigs.

The landscape of the southern steppe is quite different. Here, on the left bank, the broad Dnieper Lowland rises gradually north-eastward towards the southern end of the Central Russian Uplands, from which a number of rivers flow gently, through wide, smooth valleys, down to the

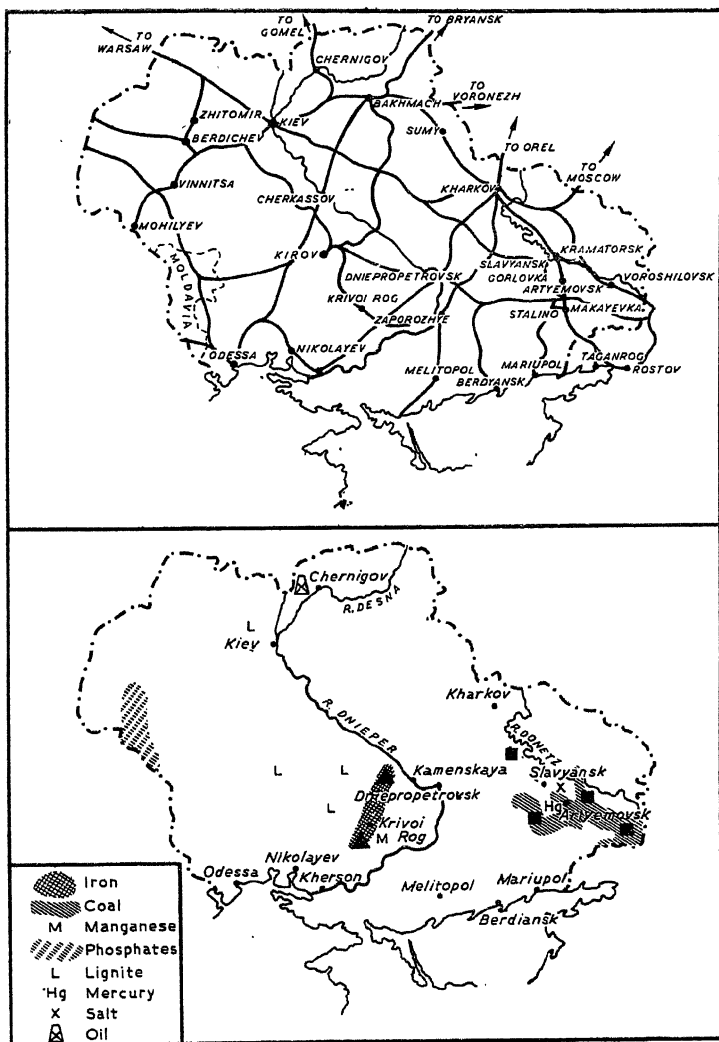


FIG. 56. THE UKRAINE: (a) CHIEF RAILWAYS; (b) CHIEF MINERAL RESOURCES

Dnieper. The loess-covered surface of the uplands is dissected by ravines. The monotonous flat plains of the Dnieper Lowland are loess-covered, too, varied only by shallow saucer-shaped depressions, particularly valuable to the farmer since they hold the waters from the melting snows of spring.¹ Throughout the lands of the left bank precipitation is slight. The dry, treeless landscape is in many respects similar to that of North Castile, and is composed largely of endless cornfields. The villages are practical rather than picturesque. The pretty thatched cottages across the river to the north-west are replaced by modern houses with tiled or corrugated iron roofs.

The southern end of the Central Russian Uplands is separated by the Donetz valley from the Donetz Heights, a hilly plateau covered with sandstones, clayey shales, and limestones, and representing the remains of old folded mountains which have been extensively fractured, worn down to the present level, and the surface deeply dissected by valleys. The north-eastern edge of the heights falls sharply to the Donetz river with picturesque chalk and limestone crags and cliffs.

The right-bank lands of the southern steppe zone specialize in wheat, sugar-beet, and pig-breeding, while on the drier left-bank lands the percentage of beet is smaller and spring wheat, sunflower, and maize are the chief crops. Within recent years large areas have been planted with cotton. A small proportion is irrigated. In the lower Dnieper valley grapes and peaches are cultivated. Thus the steppe zone of the Ukraine is predominantly a grain-growing region. Rye and barley form subsidiary crops, while sown grasses, potatoes, and maize provide fodder for cattle-rearing. About five million acres are sown with potatoes, but owing to the dry climate yields tend to be rather low. Dry-farming methods and deep tractor ploughing are now universally adopted in order to combat the effects of low precipitation.

¹ " . . . A huge, slowly undulating plain, a world of parabolic distances which make one think of the open sea."—H. P. VOWLES, *The Ukraine and its People* (Chambers).

The valleys of the Donetsk Heights form a separate region where the farmers are concerned mainly with dairy farming and orchard cultivation. Another separate region is found within the great bend of the Dnieper, below Dnieperstroi. Here a new type of highly specialized intensive 'electrified' agriculture has been introduced. The low precipitation is countered by irrigation on a very large scale, electric power from the Dnieper hydro-electric station being used to pump water from the river and deliver it throughout an extensive area. Cotton, rice, kender, fruit, and vegetables are cultivated, and cattle are reared. As early as 1935, 865,000 acres of land was served by electric threshing-machines, and 7400 acres were electrically ploughed. Some 8600 acres of arid steppe were irrigated by electric power, and there was a large number of electrically heated hot-bed frames.¹

Near the large towns of Kiev, Kharkov, Odessa, and Dnepropetrovsk there has been a considerable development of market gardening and dairy farming for urban consumption.

In the extreme south of the Ukraine there is an extensive lowland area, which slopes gently down to the Black Sea and the Sea of Azov. The low plains of this region were formed in recent geological times, and owing to a subsequent subsidence of the coast the lower parts of the river valleys were flooded, forming estuaries often separated from the open sea by sandy spits. The plains are cut by numerous dry valleys, in all probability the courses of ancient rivers. Towards the south, as the climate becomes drier, the soils change from the black to the chestnut-brown type. Winters are fairly cold, but short, and the summers are hot. Sunflower, barley, melons, Makhorkha (coarse tobacco), cotton, and rice are grown. The area devoted to barley is particularly large.

Agriculture occupies a significant position in the economy of the Ukraine. Nearly 64,000,000 acres (60 per cent. of the land) are devoted to crops. Farm-work is highly mechanized, as is shown by the fact that in 1939 there were 90,000 tractors, more than 26,000 harvester combines, and 24,000 lorries at work on the farms, and even in dry years the farms give a

¹ H. P. Vowles, *op. cit.*

much higher yield per acre than during the best years before 1917. In the U.S.S.R. as a whole almost 20 per cent. of the land under wheat, and about 30 per cent. of the land under barley, is found in the Ukraine, which also supplies the Soviet Union with large supplies of apples, cherries, pears, plums, melons, grapes, tomatoes, and hops.¹

Agricultural products form the basis of several industries—sunflower, hemp, and linseed provide vegetable oil. Beet, which occupies some 5 per cent. of the total sown area, supplies the Soviet Union with almost all its sugar requirements, and the yield of sugar-beet is extremely high. The factories, generally lying close to the fields, are situated mainly on the right-bank lands of the Dnieper.

Cotton-weaving is carried on at Poltava, and jute is manufactured at Odessa. Cattle and hogs provide the raw material for the making of leather and bristles in several towns. Hops go to the numerous distilleries, while potatoes are utilized not only for animal fodder but also in the production of potato alcohol. Flour-milling is another industry which is widespread, and at the river port of Nikolayev are the largest grain-elevators in Europe.

NON-AGRICULTURAL INDUSTRIES

The Ukraine possesses exceptionally large mineral deposits. The combination of excellent coking coal and limestone in the Don basin, on one side of the Dnieper valley, with high-quality iron ore at Krivoi Rog, on the other side,² only 250 miles away, and other iron deposits in the Kerch Peninsula

¹ In 1937 Ukrainian farms accounted for 72 per cent. of the sugar-beet, 24 per cent. of the maize, 32 per cent. of the barley, 22 per cent. of the wheat produced in the U.S.S.R., and about 20 per cent. of the total number of pigs.

² The Krivoi Rog deposits contain about 1000 million tons of iron ore (58 to 62 per cent. metallic content). In the Kerch Peninsula the reserves are estimated at 3000 million tons, and although the metallic content of the ore is only 33.4 per cent. and contains a considerable proportion of phosphorus, it occurs in thick beds (average thickness 22.5 feet) which lie much nearer the surface than the Krivoi Rog ores. Hence the Kerch deposits are cheaper to work. Donetsk coal is sent by sea to Kerch, from Mariupol, while Kerch iron supplies the ships with a return load.

to the south, is especially valuable (see p. 238). The iron and coal-producing centres are connected by rail. There are smelting and metallurgical works both in the Don basin, at Krivoi Rog, and at Mariupol and Taganrog, near the Kerch deposits, so that trains can make the return journey carrying a full load both ways—iron ore in one direction and coal in the other. This is obviously a most economical arrangement. Between the two industrial centres of the Don basin and Krivoi Rog, and connected with them by rail, lies the new industrial region around the Dnieper hydro-electric station.

The area of the Don basin coal measures, from which about 60 per cent. of Soviet coal is produced,¹ is exceeded only by that of the Kuznetsk coalfield. In the former the seams are thinner and the quality of the coal lower. But in some ways the Don basin is in a more fortunate position for industrial development. It is, for example, in the centre of a densely populated area, and connected by the best railway network in the U.S.S.R. with other large centres of population such as Moscow and Leningrad.

In addition to the iron-ore deposits mentioned above, local deposits of limestones, dolomite, and fire clays are valuable for the iron-smelting processes, while manganese, used to harden steel, is obtained from the district around Nikopol. Mercury is found in the Don basin, at Nikopol, and bauxite near Dnepropetrovsk. There is some oil-production at Chernigov and near Roman. Salt, used in the chemical industries, is found at Artyemovsk.

For several centuries the Ukraine was no more than an agricultural borderland of the Moscow State, and a constant source of discord between Russia, Poland, and Turkey. With the construction of railways, however, both its wheat supplies and its coal and iron deposits began to occupy an important place in Russian economy. To-day, with an area and population similar to that of France, the Ukraine produces similar amounts of wheat, steel, and iron.² Coal is sent to all parts of the U.S.S.R. Iron- and steel-producing towns have grown

¹ 67,100,000 tons in 1937 (three times the production of 1913).

² 8,800,000 tons of pig-iron in 1937.

up in the Krivoi Rog and Don basin regions, and the metallurgical, mining, engineering, machine-building, and chemical industries are of national importance.

The chemical industry obtains local supplies of practically every necessary raw material—salt from near Slavyansk and Artyemovsk, waste products of the coking and metallurgical industries, rock phosphates, and cheap and abundant supplies of electric power both from the Dnieper hydro-electric station and from the numerous power stations which make use of Donbas coal. Agriculture, requiring large quantities of fertilizers, makes heavy demands upon this industry. In addition to fertilizers, sulphuric, nitric, and hydrochloric acids, coke, benzol, etc., are produced, and since waste materials from the heavy industries play such a large part in this production the Donbas region constitutes a great coal-, metallurgical-, and chemical-producing region.

Between 1913 and 1938 the annual output of pig-iron increased from 2,882,000 to 8,900,000 tons, of steel from 2,410,000 to 8,467,000 tons, and of coal from 27,800,000 to more than 80,700,000 tons. More than one-half of the pig-iron production and one-third of the steel production of the U.S.S.R. was concentrated in the Ukraine in 1938.

A second industrial region has grown up around the Dnieper hydro-electric station, which was opened in 1932. The great dam, 115 feet in height, has created a reservoir which drowns the old rapids and, together with a canal cut through the left bank around the dam, has secured through navigation of the river. The total capacity of the power station is 550,000 kilowatts. Electricity is transmitted through the regional grid system which links the Dnieper station with others which operate on coal. The total output of electric power in the Ukraine is now about 1,750,000 kilowatts.

Thus there are three great industrial areas in the Ukraine. The Donbas includes the towns of Kirovgrad, Stalino, Voroshilovsk, Voroshilovgrad, Artemovsk, Slavyansk, etc. Voroshilovgrad and Stalino and Voroshilovsk specialize in locomotive-building. Kramatorskaya is the centre of a powerful industry which supplies furnace equipment and

machinery for coal-mining and the metallurgical industry. Voroshilovgrad (formerly Lugansk) is the oldest iron and steel centre of Southern Russia. It was here that the first experiments made in Russia in the smelting of iron with coke took place in 1797. The success of the process led to the complete decline of the Urals, where charcoal was used, and sufficient coal could not be found locally. During the last few years Voroshilovgrad has been known throughout the Soviet Union as the centre for the construction of the latest types of Soviet freight and passenger locomotives.

The chief centres of the chemical industry are Slavyansk, Lubichansk, Gorlovka (which also specializes in the construction of mining machinery), and Konstantinovka.

Within the Dnieper industrial region we find the iron and steel and engineering works of Zaporozhe, Dneprdershinsk, and Dnepropetrovsk, well situated for receiving coal from the east and iron from the west, with unlimited supplies of electrical power close at hand, and producing high-quality steel, tractors, ball-bearings, machine-tools, agricultural machinery, etc. Steel alloys and aluminium, both requiring large amounts of electricity, are also manufactured, while the waste products from the undertakings mentioned above supply the chemical industry with its raw materials. At Dnepropetrovsk, and to the south at Nikolayev, there are railway-wagon works.

All these industries are intimately connected one with another in order to obtain the most economical utilization of raw materials, waste products, and transport. They have all been planned and organized jointly as parts of a major producing unit, known as the Dnieper Industrial Combine.

Across the Dnieper to the west, in the stony ridge of the Volhynia-Podolsk Upland, lie the iron-mining settlements, the chief of which is Krivoi Rog. Both in this town and at Kamenskaya there are large metallurgical undertakings. Apart from the high-grade haematite iron deposits of this region, however, the Oolitic ores of the Kerch Peninsula are also used in the Ukraine. The iron and steel works at Mariupol and Taganrog use these ores exclusively.

Outside these main industrial areas, but lying in a central position in relation to them, and depending upon them for supplies, the city of Kharkov is to-day the third most important engineering centre of the U.S.S.R. Its factories produce large numbers of tractors, mining and electrical equipment, turbines, and locomotives. At Kiev, chemical apparatus for the sugar-beet industry is manufactured.

A number of towns—Berdyansk, Odessa, Kiev, Kherson, and Melitopol—are engaged in the manufacture of various types of agricultural machinery for the farms of the Ukraine. At Kiev river craft are constructed, while at Nikolayev there is a shipbuilding industry, engaged in the construction of vessels for the Black Sea mercantile fleet.

It should now be clear that in the Ukraine there is a remarkable combination of agricultural and industrial wealth, both highly developed, together with a dense population. It is not surprising, therefore, that it occupies a very high place in Soviet economy, being one of the chief sources of grain and food, as well as the largest coal and metallurgical base for the whole of the U.S.S.R.

COMMUNICATIONS

At the dawn of Russian history the Dnieper was being used as a trade route through what is now the Ukraine, from the Black Sea to the north. When larger ships were introduced during the last century the river ceased to be of any considerable value as a navigable waterway, because it was obstructed by rapids at Zaparozhe, and was generally too shallow. It is only since the completion of the Dnieper hydro-electric power station that the rapids have disappeared and the level of the river has been raised, so that a certain revival of navigation has taken place.

The Dnieper and its tributaries, however, are of great value for local traffic between the towns and villages along the valleys. The Desna, for example (a left-bank tributary of the Dnieper), is an important local highway, passing from Kiev to the north-east through pleasant and fruitful country-

side. Timber is floated downstream and convoys of barges carry heavy loads of pig-iron, lime, and agricultural produce.

Peter the Great used the river, as he used the river Don, to assist the southward expansion of the Russian State. He opened a wharf and shipbuilding yard at Bryansk, and built a river flotilla. The surrounding forests provided the timber.

Steamships have been plying between Chernigov and Kiev since 1846, and along this section of the Desna navigation is still moderately good. When the Great Dnieper Project is completed through navigation will be opened up from the Dnieper at Kiev to the Oka and the Volga.

The Black Sea ports, Odessa, the largest, Kherson, Nikolayev, etc., are of great value for foreign trade, and for communication with the Caucasus. But the most outstanding feature of the communications which serve the Ukraine is the excellent network of railways, particularly necessary for the full economic development of a region possessing such enormous agricultural and industrial resources. No other part of the Soviet Union is so well equipped in this respect.¹ These railways carry coal, grain, salt, and sugar to other parts of the country, and bring into the Ukraine timber (via the Volga as far as Stalingrad and thence by rail) and oil, which is transported by pipeline or railway to the Black Sea coast, by sea and rail, to Rostov, and then by rail to the Ukrainian towns.

POPULATION

Approximately 20 per cent. of the population of the U.S.S.R. is to be found in the Ukraine, although this republic occupies only 2 per cent. of the total area of the Union.² The majority of the people—about 60 per cent.—are Ukrainians. In the north-east there are considerable numbers of Russians, and in the north-west Byelorussians.

In spite of the fact that there are large industrial areas,

¹ The density of the railway network is 32.2 kilometres per 1000 square kilometres. The Ukraine possesses about one-third of the total length of railways in the U.S.S.R. The new Moscow-Donbas trunk line is particularly important for the transport of coal.

² In 1939, before the addition of Western Ukraine.

only 36 per cent. of the population is urban. This is due to the dense agricultural population of the farm-lands. The drier lands to the east of the Dnieper are not so densely peopled as those to the west, where agriculture is of a more intensive type.

The villages are generally situated near the rivers, where water is available, or in dry valleys where it is easy to sink wells. This 'control' of the site of the villages is most apparent in the lands on the left bank. In some of the more densely peopled districts the villages are strung out along the valleys in a long, often unbroken, line, each being connected to the next, thus forming a continuous ribbon of settlements.

The high proportion of people engaged in agriculture and the major industrial towns are shown in the table below.

THE POPULATION OF THE UKRAINE (1939)

Urban	11,195,620		
Rural	<u>19,764,601</u>		
Total. . . .	<u>30,960,221</u>		
Kiev	846,293	Vinnitsa	92,868
Kharkov	833,432	Moghilev	99,440
Dnepropetrovsk	500,622	Kherson	97,186
Stalino	462,395	Kremenchug	89,554
Odessa	604,223	Melitopol	75,735
Krivoi Rog	197,621	Slavyansk	75,542
Nikolayev	167,108	Kirovograd	100,331
Mariupol	222,427	Artyemovsk	55,165
Zaporozhe	289,188	Voroshilovsk	54,794
Zhitomir	95,090	Cherkassy	51,693
Berdichev	66,306	Sumy	63,883

Kiev and Kharkov are the most important towns. Kiev is the third largest city of the U.S.S.R. One of the most ancient of Russian cities, the capital of the Slav principality of "Kiev Rus," and a trading centre on the Dnieper over a thousand years ago, it is situated at a junction between the Dnieper and the railways from Moscow to Odessa, and from Poland to Stalingrad. Three valleys join the Dnieper valley north of Kiev, the valleys of the Desna, Pripet, and Sozh.

It is an important centre for the manufacture of beet-sugar. Its factories produce in addition ships, tramway rolling-stock, textiles (silk and knitted goods), leather, boots and shoes, chemicals, machines such as automatic lathes, etc.

Kharkov does not possess the same historical traditions as Kiev. Founded about three hundred years ago on the borders of the early Russian State, as a settlement of immigrant Crimean Tartars on the banks of the Kharkov river, it occupied a central position in the Ukraine, and between the Ukraine and Moscow, and by 1653 its importance had increased to such an extent that it was made the administrative centre of the area known as "Slobodskaya Ukraine," a part of Southern Russia where immigrants from surrounding lands (*e.g.*, Poland and Lithuania) were allowed to settle.

Kharkov soon became the gateway to the southern iron areas and the coal-mining region of the Donetz basin. It lay close to two natural highways to the Black Sea—the Dnieper and Donetz valleys—and was therefore a commercial centre.

These advantages of geographical position have continued to the present day. Kharkov was the capital of the Ukraine under the Soviet administration until 1934, as well as being one of its most outstanding industrial and cultural centres. In 1934 the capital went back to the more ancient historical town of Kiev. Kharkov, however, now surpasses the latter as an industrial town. It is one of the most important engineering centres of the Soviet Union, and is situated at the junction of main-line railways from Moscow, the Crimea, Kiev, Dnepropetrovsk, Kherson, Rostov, and Stalingrad, while the new express main-line for coal transport between the Don basin and Moscow passes through it.

To the south-west of the Ukraine is Moldavia, with its administrative centre at Tiraspol. This republic forms a continuation of the South-western Ukraine, and is engaged in similar forms of agriculture. Maize, wheat, and potatoes are the main crops, while there are also orchards, vineyards, and tobacco plantations, especially on the terraced slopes of the Dniester valley.

Western Ukraine and Western Byelorussia

The western regions of the Byelorussian and Ukrainian Soviet Republics were included within the territory of Poland after the Great War, and remained under Polish control until November 1939, when they became part of the U.S.S.R.

Geographically they form simple westward extensions of the two Soviet Republics of Byelorussia and the Ukraine, extending southward from the Lithuanian border across the Pripet Marshes into the former south-eastern corner of Poland, including Eastern Galicia and part of the ancient province of Volhynia.

They form a section of that western frontier of the U.S.S.R. which for centuries has been difficult to stabilize, since the Russian Plain passes from Eastern into Western Europe without any strong natural divide between the two. The only obstacle of any significance is the Pripet Marshes. This geographical fact is reflected in history. Poland forms a transitional region between east and west. To the west are the countries of Western Europe, which have had a cultural and economic evolution quite different from that of Eastern Europe. The Germans, for example, are largely Protestant, while the Russians traditionally adhered to the Greek Orthodox faith, and received their earliest elements of civilization from Constantinople. Between the two are the Poles—a Slavonic people—neither Protestant nor Greek Orthodox, but Roman Catholic. They received their early civilization from Italy.

Poland also lay between the conflicting economic interests of East and West. The nations of Western Europe, particularly Germany, tended to extend their frontiers eastward, while Russia attempted to expand towards the west. Although Poland, as a dual monarchy with Lithuania, maintained an empire from the fourteenth century onward, which extended in 1740 as far east as the Dnieper, and included Byelorussia and most of the Ukraine, the bordering states of Germany, Russia, and Austro-Hungary divided Poland between them during the latter half of the eighteenth century, and until 1919 the Polish State ceased to exist.

Poland, like the Russian Empire, of which a large portion of her territory formed a part before 1919, was a backward agricultural country with a poorly developed industry. Whereas Soviet economy made rapid progress after the Great

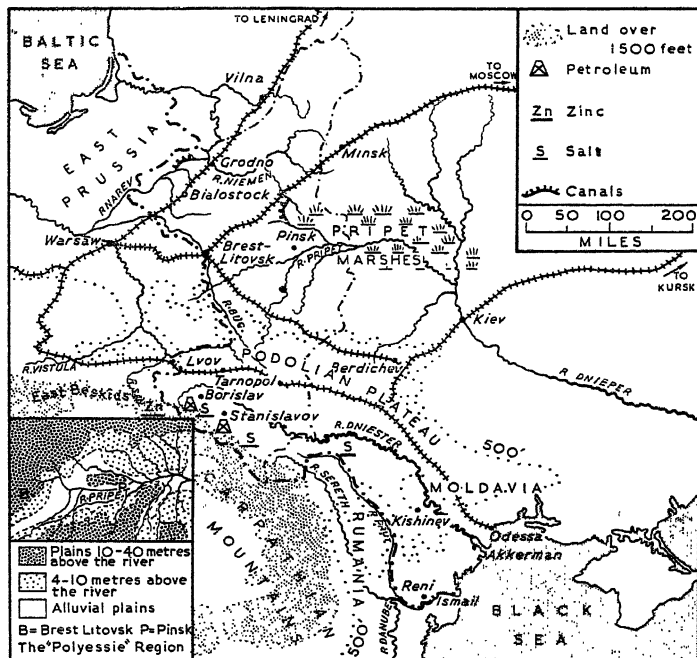


FIG. 57. WESTERN BYELORUSSIA, WESTERN UKRAINE, AND BESSARABIA

War, both agriculture and industry expanding very quickly, Polish economy did not advance to the same extent.

Parallel with the development of Soviet economy went the recognition of the rights of national minorities. Byelorussia and the Ukraine were formed into separate republics. They used their own language, developed their national culture, and made rapid strides in the education of their peoples.

In the Ukrainian S.S.R. the administration of the republic is in the hands of Ukrainians, and the native language is used everywhere. There were, in 1937, 17,736 schools, catering for the needs of over 4,000,000 children. There were 278 scientific research institutes. There were 27,344 collective farms, covering 87,500,000 acres, and employing 84,000 tractors and 27,000 combine harvesters. The wheat harvest was greater than that of Germany, Poland, and Hungary together.

In Western Byelorussia and Western Ukraine, however, the Byelorussians and Ukrainians, mostly peasants, suffered both from the backward state of Polish agriculture and from their treatment as a national minority. In 1920 the Poles had taken Kiev and attempted to hold the entire north-western part of the Ukraine. The Red Army drove the Polish Army from the Ukraine and swept on to the gates of Warsaw, but were then compelled to retreat. A new frontier was defined which left a large Byelorussian and Ukrainian population within the new Polish State. In the north, between Lithuania and the Polish frontier of 1938, from 25 per cent. to 40 per cent. of the people are Poles. Farther south this percentage decreases to about 10 per cent., rising to between 25 per cent. and 40 per cent. near Tarnopol, but falling again to 10 per cent. to the south of Stanislavov. In Western Ukraine there are five or six million Ukrainians, forming 75 per cent. of the population in Galicia, east of the river San (see p. 526).

The Polish Government made many promises regarding the rights of the Ukrainian minority, but kept none of them. Thus in 1923 there were 3030 Ukrainian schools in Poland; but by 1930 this number had fallen to 700.¹ From 1920 to 1939 there was constant strife between Poles and Ukrainians, reaching a high level in 1930, during Pilsudski's reign of terror.

As peasant farmers the Ukrainians suffered from lack of land. Between 1919 and 1925 there was some redistribution of land in Poland, but not on a sufficiently large scale. There

¹ H. P. Vowles, in *The Ukraine and its People*.

was often discrimination in favour of Polish peasants. In any case, an increase in the number of small holdings merely served to intensify the agrarian problem. The small holding is uneconomic, and tends to prevent the use of agricultural machinery and modern scientific methods. Both in the Western Ukraine and Western Byelorussia, agriculture and industry remained in a backward condition and the peasantry in particular suffered under a regime of persecution, unceasing toil, taxes, and debts.

THE NORTHERN MORAINÉ ZONE

North of the Podolian plateau the landscape and soils have been determined largely by the effects of glaciation. The northern part of Western Byelorussia comes within the Baltic moraine zone. It is crossed by numerous forested morainic ridges, with flat, marshy lowlands and valleys between them. The soils are poor, the climate damp. Where the forests have been cleared rye and potatoes are grown and pigs are reared.

Farther south the landscape is one of vast level and monotonous plains, crossed by only slight valley depressions and occasional low morainic hills. Much of the land is desolate, covered by marsh and forest. Only a small proportion is devoted to agriculture—dairy farming and the cultivation of flax, potatoes, and rye. Remnants of serfdom and feudal economy have persisted until recent years; farm economy is particularly backward, and the density of population falls to below 35 per square mile.

Across the plains run the ancient east-west valleys which drained the Russian Plain at the end of the great Ice Age, when the outlet to the Baltic was still blocked by the ice-sheets. The valleys are natural route-ways from Russia to the West, and cutting across the present north-south river valleys, make possible the creation of an excellent system of river, canal, and railway communications.

Although some railway-lines follow these routes, little has been done to utilize to the full their potential value as through ways between Eastern and Western Europe.

The Polyessie

The southern portion of these plains, and the low marsh lands around the Pripet and its tributaries, which extend from the south of Western Byelorussia into the north-west Ukraine, are known as the "Polyessie."¹ The lower plains present a landscape of endless bogs² and chains of lakes. The land around the lakes rarely rises to a height of 15 feet above the surface of the water. The only break in the grey-green monotony of this inhospitable country is provided by occasional sand-dunes, or the pine-woods which cover the few patches of drier land.

Around the edge of the "polyessie" proper—the plains and marshes in the lower parts of the Pripet basin—there are higher plains, rising to between 30 and 120 feet above the level of the rivers (see Fig. 57), and formed from Cretaceous and Tertiary deposits. The surface is slightly undulating, and the ground drier, so that the majority of the population is found here, and the landscape is dotted with small villages, fields, and woods. In early geological times the site of these plains was occupied by a mountain range, running parallel to the Urals. They have been completely peneplained, and the ancient rocks were covered by sedimentary deposits laid down under Cretaceous and Tertiary seas.

During the retreat of the Quaternary ice-sheets the Polyessie lands formed a great gulf between the ice-sheets and the Podolian Uplands, flooded by the waters from the melting ice which laid down thick deposits of sand. After the ice had finally retreated the sand was blown into dunes along the valleys.

In some places there are large stretches of undulating sand broken by low ridges, while the dunes themselves may be

¹ See p. 407.

² In the whole of the Byelorussian or White Russian Republic there are about five million acres of bog and marsh. Many of the bog-soils, when drained, are exceedingly fertile, since they contain natural phosphate deposits. Thus they give higher yields than the poorer podsolized soils of the higher and better-drained land which needs heavy applications of fertilizers.

three to four miles long and 60 feet high. The slopes are covered with thick pinewoods.

The light-coloured sands and dark pinewoods stand out in strong contrast to the sombre country around the dunes. Rising above the marshes, they form bridgeways across the bogs, and are generally followed by roads.

Brest-Litovsk (30,000) is a small agricultural centre and timber port on the river Bug. It lies on one of the glacial valley routes which pass from the east through the Pripet Marshes across the valley of the Bug to the Vistula. It also controls the entrance to the Bug valley.

Bialostock is a textile-manufacturing town on the river Narev (a tributary of the Bug). It is connected by canal to the Niemen, the canal following the floor of one of the valleys formed at the end of the Quaternary glaciation. Another former valley provides a route-way to Vilna and is followed by the railway from Bialostock. Yet another runs to the south-east of Grodno, from the upper Niemen to Pinsk and the Pripet. A canal joins the two river basins. A project has been considered for providing a through waterway from the Baltic, along the Niemen and Pripet, to the Dnieper and the Black Sea. In Pinsk there are textile, chemical, paper, and timber industries.

VOLHYNIA, PODOLIA, AND THE SOUTHERN LANDS OF WESTERN UKRAINE

To the south of the Polyessie the land rises to the Volhynian hill country and the Podolian Plateau, in Western Ukraine. This is the western extension of the fertile black earth region of Southern Russia. In Volhynia the formation beneath the black earth and loess is chalk; in Podolia it is limestone. The increase in the fertility of the land from the Polyessie in the north to the black earth lands in the south is marked by an increase in the density of the population from below 35 to nearly 50 per square mile. The wide, treeless, level or rolling plains are cut by gullies and ravines, and wide, mature valleys. The summers are warmer than in Western Byelorussia. Wheat

takes the place of rye as the chief grain crop, sugar-beet and hops are cultivated, and pigs and horses reared. Under Polish rule large estates and feudal remnants of serfdom were common. Artificial fertilizers were not used on the land, and the yield per acre was very low.

Along the southern edge of the Podolian Plateau lies the Galician depression. It follows the Dniester valley, as a continuation of the San-Vistula depression, between the Carpathians and the edge of the rigid block of the Russian platform in the Podolian Plateau. The depression forms an important route from Silesia through Bessarabia and Rumania to the Black Sea, although the Dniester itself is of little value as a waterway.

Along the southern edge of the depression the land rises gradually to the forested slopes of the Carpathians. Forestry and pastoral industries are the chief occupations. Rock salt and zinc are mined in the foothills, and there are considerable petroleum deposits.

In North-western Podolia, between Lvov and the Dniester valley, lies a high plateau region, known as the "Opolye." It rises to over 1200 feet above sea-level in the north, and is deeply dissected by the wide valleys of the tributaries of the Dniester. These wide valleys and the smoothly sloping hills offer a strong contrast to the narrow cañon-like ravines which are so common elsewhere in Podolia. Many of them are connected with each other by the depressions of ancient valleys. The Dniester itself originally flowed along the Bug valley.

Along the hillsides are terraces, varying in height between about 135 and 360 feet, the highest belonging to the early Quaternary period, when the "Opolye" and the Podolian hill country formed a low plain, drained by the long, unstable meandering streams of the Dniester and its tributaries. The subsequent raising up of the land *en masse* caused the rivers to incise deeply into the plateau, leaving terraces to mark the former levels. The terraces sometimes carry boulders of Scandinavian origin, carried here by the waters of the melting ice-sheets. The valley soils are rich in humus and lime. In

the whole "Opolye" region 50 to 75 per cent. of the land is cultivated, the remainder being covered largely by deciduous forests in which the oak is the most common tree. To the east of the "Opolye" the oak is rarely seen.

Wheat, rye, and flax are the most important crops, together with hops in the north and sugar-beet in the south. The main industrial occupations are concerned with timber, sugar-beet, and dairy products.

In the south-east of Western Ukraine is a region known as "Pakutnaya Podolia." It lies between the river Dniester and the Eastern Beskids, outliers of the Carpathians. To the south-east the forested slopes of the Eastern Beskids are cut by broad valleys. Above the slopes the mountain-tops, composed largely of sandstone, are weathered into fantastic columns and caverns. To the north and east the Eastern Beskids give way to ridges of picturesque hills along the edge of the Volhynia-Podolsk Plateau, occupying the watershed between the upper Prut and the tributaries of the Dniester.

At the end of the Tertiary period Pakutnaya Podolia was a wide plain sloping towards the Dniester. Then the level surface was warped, and in this process a number of high ridges and a series of north-west-south-east depressions were formed. The Prut, which formerly flowed slowly northward into the Dniester valley, changed its direction and began to flow to the south-east. The raising up of the land brought about the formation of the narrow valleys of the Podolian Plateau. Their steep sides are covered with oak- and beech-woods.

The Dniester valley is bounded by steep, precipitous slopes, crowned with enormous limestone crags. The bottom of the slopes is covered with a thick growth of hazel-bushes and wild pear, while the valley floor, along which the river meanders, is clothed with golden fields.

The plateau between the Prut and the Dniester forms fertile black earth steppe, now almost entirely cultivated. The mild climate favours the cultivation of maize, vines, and tobacco, as well as wheat and rye. In the gardens around the farm-houses apples, pears, plums, and cherries are grown.

The chief industrial resources of the region are the oil

deposits of the Borislav district. The oil-bearing zone of the northern slopes of the Carpathians commences near the Western Ukraine, extending from the Dunaitsa and Byeloi valleys to the upper Prut, where it turns south-west into Rumania. The forested mountain slopes, with their grey rocky summits, rise to over 6000 feet—an eastern extension of the Alpine system of mountain folding.

Intense folding caused successive folds to be piled on top of one another. The young sedimentary rocks, mainly limestones, have undergone metamorphism in the more deep-seated layers, generally becoming crystalline, and in some places have been exposed by denudation. The sedimentary rocks were formed in seas of moderate depth, and as the folds rose from the sea, shallow water deposits were laid down—generally sandstones and clays known as “Flysch.” Denudation rapidly reduced the height of the mountains, which were, however, rejuvenated by an upward movement *en masse* at the beginning of the Quaternary period.

Within the areas of “Flysch” are found oil deposits formed during the Cretaceous and Tertiary periods when the climate was wet and tropical and the low-lying seashore was covered by lagoons, lakes, and river deltas, surrounded by, and partly overgrown with, tropical vegetation. Oscillation of the level of the land caused the sea-floor itself to be alternately raised (and covered with forests and swamps) and submerged.

In mid-Cretaceous times intense folding caused remnants of the organic matter from the tropical vegetation to be ‘trapped’ between the folds, together with salt water. The chemical action of the salt water, under immense pressure, brought about the formation of oil in the lower folds. In the higher folds the organic deposits were not covered by a sufficiently deep layer of protective rocks, and were removed by denudation.

Unplanned exploitation of these oilfields in the past led to a fall in output from 2,000,000 tons in 1909 to 514,000 tons in 1935. Most of the oil was exported, and the high price in the home market made it impossible for the peasants of Western Ukraine to buy paraffin for domestic use. After the

Western Ukraine became a part of the Ukrainian S.S.S.R. in 1939 the production of the oil-wells of the Drogobich-Stanislawov region was doubled.

Lvov is the largest town of the Western Ukraine. It has a population of about 240,000. Founded seven hundred years ago by the Russian prince, Daniel of Galicia, it became a centre of Ukrainian culture, the capital of Russian Galicia,¹ and an important commercial centre on the old route from Cracow to Kiev.

During the fourteenth century the town was seized by the Poles, who partitioned the Ukraine. For 450 years the Poles held Lvov. Then the Germans seized both Polish and Ukrainian lands and took both Cracow and Lvov, holding them for 150 years. The latter town was again taken by Poland after the Great War. Its main industries are concerned with metallurgy, mining and wood-working, and the manufacture of textiles, chemicals, and paper.

Bessarabia and Northern Bukhovina

In 1940 those parts of Northern Bukhovina and Bessarabia where the population is predominantly Ukrainian were incorporated in the Soviet Union, the former becoming part of the Ukrainian Republic and most of the latter part of the Moldavian Republic. Six districts around Kishinev, with a population about 70 per cent. Moldavian, went into the Moldavian Republic, the mainly Ukrainian areas joining the Ukrainian S.S.R.

These small frontier areas of the U.S.S.R. have been in the past the cause of strife and contention between various great powers. In early history the Greeks, Romans, Goths, Huns, and Bulgars all invaded these lands. In the thirteenth century the Mongols, sweeping across Europe, entered Bessarabia. During the same century Genoese traders established themselves on the Dniester river. During the fourteenth century Bessarabia was ruled by a prince of Moldavia, while

¹ Galicia was finally incorporated in Poland in 1347, and about the same time most of the other Ukrainian lands became part of Lithuania (*Russia: a Social History*, by D. S. Mirsky (Cresset Press)).

in the sixteenth century it passed alternately between the Crimean Tartars and the Turks, remaining as a cause of dispute between the Russians and the Turks in the eighteenth century. It was annexed by Russia in 1812. Moldavia, west of the river Prut, was left to the Turks.

Bukhovina, at the junction of the Polish, Czech, and Rumanian frontiers, was a principality of Moldavia, occupied by the Russians in 1769, the Austrians in 1774, and then was ceded to Turkey in 1777. From 1849 to 1918, however, Bukhovina was included within the Austrian crown lands. After the Revolution part of it passed, together with Bessarabia, under Rumanian control, and part was taken by Poland.

The Treaty of Paris (1920), by which Bessarabia was recognized as a province of Rumania, was not signed by either the United States of America or the U.S.S.R., and the latter never admitted the legality of Rumania's possession, but regarded Bessarabia as being Soviet territory occupied by Rumania.

In 1940 both Northern Bukhovina and Bessarabia came into the Soviet Union (see note at p. 526).

Relief and Climate

The Russian platform extends under the Volhynia-Podolian Plateau in the Ukraine and its continuation in Bessarabia to the Carpathians. It is covered with Tertiary deposits, and these, overlaid with loess, form the basis of the fertile black earth region of the Volhynia-Podolian Plateau.

Central Bessarabia is deeply dissected by the tributaries of the Dniester and the Prut, so that from the valleys the landscape appears very hilly. This is especially noticeable in the centre of the anticline which passes through this region from west to east. The soils of the valleys are often poor, and the land marshy. Forests of beech and oak are common.

In the south the land merges into the Budjak steppes and the sandy and salt-marsh country around the lagoon-fringed Black Sea.

The climate is continental, January average temperatures

falling several degrees below 32° F. and the July averages exceeding 70° F. The rainfall, mainly in summer, is light, the annual precipitation being about 25 inches. Hence Bessarabia and Northern Bukhovina form the continuation of the Ukrainian steppe lands (now almost entirely cultivated) with the exception of the forested hilly country in the centre.

Agriculture

Climatic conditions and the fertile soils are excellent for the cultivation of grain. Wheat and maize are the chief crops. Tobacco is also grown, and fruits and the vine are widely cultivated.

Sugar-beet is an important crop in North-west Bessarabia and Northern Bukhovina. In the mountains of Bukhovina pastoral occupations prevail, and considerable numbers of sheep, cattle, and horses are reared in the Bessarabian steppe.

Agriculture, however, remained in a very backward state under Rumanian rule. Farming methods were often primitive; subsistence farming, with the employment of only the simplest machinery, was common everywhere, and relics of serfdom and ancient customs were still to be found.

The dry loess plateau land is not suitable for subsistence farming. Modern large-scale methods of agriculture and the employment of machinery would increase the productivity of the land enormously, and the introduction of these will be one of the results of the incorporation of Bessarabia in the Ukrainian Republic.

Population

Bessarabia bore the brunt of several Turkish invasions of Europe, and the countryside was largely depopulated during the Turkish wars. During the early nineteenth century large numbers of Ukrainians and Russians came to settle here, and to-day they form a good proportion of the total population of about three million.

The Rumanians live chiefly on the broad hilly spurs of the Carpathians, between the Dniester and the Prut. The low-

lying land along the valleys is occupied by peoples of Cossack and Tartar origin. It was along these valleys that the Huns, Slavs, Bulgars, Magyars, and Tartars migrated into Europe in early historical times.

According to Bowman in *The New World: Problems in Political Geography* (Harrap), the Rumanians enjoy an absolute majority to the north of Kishinev, where they exceed in numbers all other national groups together. There are, however, large Jewish and Ukrainian minorities (10 to 20 per cent. of the total). Close to Kishinev itself there is a very large Russian minority.

To the south of Kishinev the Rumanian population is not as large as the Russians, Ukrainians, and Jews combined, while in the extreme south the Ukrainians form a national group larger than either of the two most important minorities—the Bulgarians and Rumanians.

The population of the whole of Bukhovina is about 800,000, composed almost equally of Rumanians, Germans, and Ukrainians (Ruthenians). The Rumanians spread into Bukhovina across the plains from the south, while the Ukrainians came into the country from Galicia, and form the majority of the population in the north. It is this northern portion that is now a part of the Ukrainian S.S.R. In Bessarabia and Bukhovina together there are about 800,000 Ukrainians.

It is clear, therefore, that physically and ethnographically Bessarabia and Northern Bukhovina form the natural borderlands of the Russian Plain. Economically they are even more strongly bound to Russia.

Communications

Under Tsarist rule the railways were designed to converge upon Odessa. The one exception has its terminus at the port of Akerman, which, however, was in turn connected by sea with Odessa.

These railways and the river Dniester were the natural outlets for the agricultural produce of the country—grain, wool, fruit, and wine, while the vast Russian lands provided

the market. Under Rumanian rule the railways not connected directly with Rumanian ports were of no value for trade, and the Russian market was closed. The Dniester was no longer available for the shipment of agricultural products, and apart from this, both the Dniester and the Prut are slow-flowing, meandering rivers, difficult for navigation. Rumania, herself an agricultural country, with no great industrial centres, could not take the surplus from the Bessarabian towns. The peasants were in a particularly unfortunate position owing to the small size of their holdings¹ and the fact that much of the land was in large estates, the property of wealthy land-owners.

During the twenty-three years of Rumanian occupation there were many peasant revolts. The area of land down to crops fell to less than one-third of that of 1913, while the number of cattle was more than halved.

The redivision of the land which took place after the entry of Bessarabia into the U.S.S.R. in 1940 proved to be a very popular measure, the peasantry receiving altogether about 440,000 acres of new land.

Industry

The main industrial resources of the new territory of the Ukrainian and Moldavian Soviet Republics consist of brown coal deposits in the south, near the Prut valley, and oil and salt between the Upper Dniester and the Upper Prut (see Fig. 57). Lumbering is carried on in Northern Bukhovina. Elsewhere industry—mainly on a small scale—is concerned with flour-milling, sugar-refining, and leather and tobacco manufacturing. In the limans, or lagoons, on the shores of the Black Sea fishing is an important occupation.

The chief towns are Kishinev (117,000), Akkerman (a second-rate port on the Black Sea), Ismail (a river port on the Dniester), and Reni and Kagul (river ports on the Prut).

¹ In Bukhovina the majority of the holdings were below 20 acres and some as small as 2 acres. In Bessarabia they were up to 25 acres.

AREA AND POPULATION OF THE WESTERN BORDER LANDS

	<i>Area</i> (Sq. miles)	<i>Estimated population</i> (1939)
W. Byelorussia and		
W. Ukraine . . .	75,200	12,500,000
N. Bukhovina . . .	2,300	500,000
Bessarabia . . .	17,100	3,200,000

NOTE ON THE POLISH FRONTIER QUESTION
(See p. 514)

The Curzon Line was based on the ethnographical findings of the Polish Affairs Commission of the Peace Conference and was accepted by the Soviet Government as the Polish-Soviet frontier. Poland, however, seized the Lithuanian district of Vilna in 1919 and attacked the Soviet Union in 1920. By the Treaty of Riga (1921) the U.S.S.R. was compelled to accept a new frontier much farther east, leaving over 9 million Byelorussians and Ukrainians in the new Polish State. The population figures at p. 514 possibly give too much weight to the proportion of Poles. An article in *The Times* (January 12, 1944) gives some reasons for doubting official Polish statistics, and comes to the conclusion that out of a total population of about 11½ millions east of the Curzon Line, there were hardly more than 2½ million Poles.

BIBLIOGRAPHY

English

- W. E. D. ALLEN: *The Ukraine* (Cambridge University Press, 1940).
H. P. VOWLES: *The Ukraine and its People* (Chambers, 1939).

Russian

Articles published in "Nasha Strana" (Moscow)

- N. KALMA: "Through the Chernigov Region," in No. 2, 1939.
"Mikoyan-Shakhar," in No. 7, 1939.
B. LYAKHOVSKI: "The Capital of the Donbas" (Stalino), in No. 9, 1939.
V. KHOLODOVSKY: "Voroshiloviradskaya" (region south of Voronezh), in No. 6, 1940.
V. VLADIMIROV: "Petrovka-Irmino-Stakhanovsk" (Don basin), in No. 6, 1940.
S. ORLOVA: "The Thirteenth Union Republic," in No. 9, 1940.

The Western and Central Regions and the Baltic Republics

The Western Region

THE Western Region embraces the Byelorussian S.S.R. and the former Western (Administrative) Region, and is situated on that part of the European Plain which lies between Poland and Latvia to the west and the Central Region of European Russia to the east. The territory of the Western Region has always occupied a position of strategic significance as a borderland between the states lying close to the Baltic and the important industrial region of Russia, with its centre in Moscow.

The general uniformity of climate and the predominance of glacial forms of relief unite the whole area into a single natural region. But local variation in relief, and particularly in the character of the river-net, make possible the following subdivisions: (1) the north, with a morainic landscape; (2) the Central Russian Uplands in the east; (3) the Polyessie lands of the west.

In the north, along the edge of the great Pre-Baltic Lowland—extensive plains which are occupied by bogs and marshes—there are several rows of broken morainic hills. Between two of the highest rows, known as the Valdai Heights, lies a depression which contains a series of lakes and the sources of the streams which flow in one direction towards the north Dvina and to the Volga in the other. It was in this depression that the early portages between the two rivers were made. During the spring floods, when the land is inundated, it is impossible to determine the position of the actual water-parting, the waters flowing now to the west, now to the east.

The Central Russian Uplands in the east constitute a gently rolling upland plain, broken only by gently sloping hills of insignificant elevation and broad marshy valleys. The eastern part of the upland is higher, and the surface more dissected.

In the north there are limestone outcrops, where potholes, underground caverns, and disappearing streams are common features.

The south-western section of the Western Region consists of a broad lowland depression, drained by the river Pripet. Slightly elevated patches of sandy deposits, clothed with coniferous forests, occur amid enormous tracts of swamps and bogs which cover hundreds of square miles. These marshy lands, known in Russia as the Polyessie, are covered with an intricate network of interconnected streams and rivers. During the spring floods the Polyessie have the appearance of a vast lake, in which the elevated sandy areas stand out like islands. Large stretches of these marshes have been drained and are now used as meadows or arable land.

Climate and Vegetation

The climate is distinctly humid, so that agriculture is not hindered by droughts. In the east the temperature conditions are similar to those prevailing around Moscow. But towards the west the increased effect of oceanic influences is apparent, so that the winters are not so cold, the summers are not so hot, and the precipitation is relatively heavy. In the south-west winter lasts for only three months. Thaws often occur in January and February. This change of climate from north-east to south-west finds its reflection in the natural vegetation. In the forests of the north and east coniferous trees and the birch and aspen predominate, while in the south-west the oak, lime, maple, and hornbeam are the chief trees. About two-thirds of the forested land has been cleared for agriculture. The bog vegetation varies, and, according to local conditions, reeds, rushes, sedge, or coarse grasses are found. In the northern Polyessie lands the marshes and patches of coniferous forest are strongly reminiscent of the cold northern parts of the Soviet Union, while the landscape of the deciduous forest lands is more akin to that of the right-bank lands of the Ukraine in the south.

Agriculture

The poor clay or sandy podsolized soils, and the damp cool

climate, limit the growth of grain. On the drained peat-bogs, however, the yield of winter rye, grown for local use, and of oats is higher, acre for acre, than in Denmark.¹ Everywhere

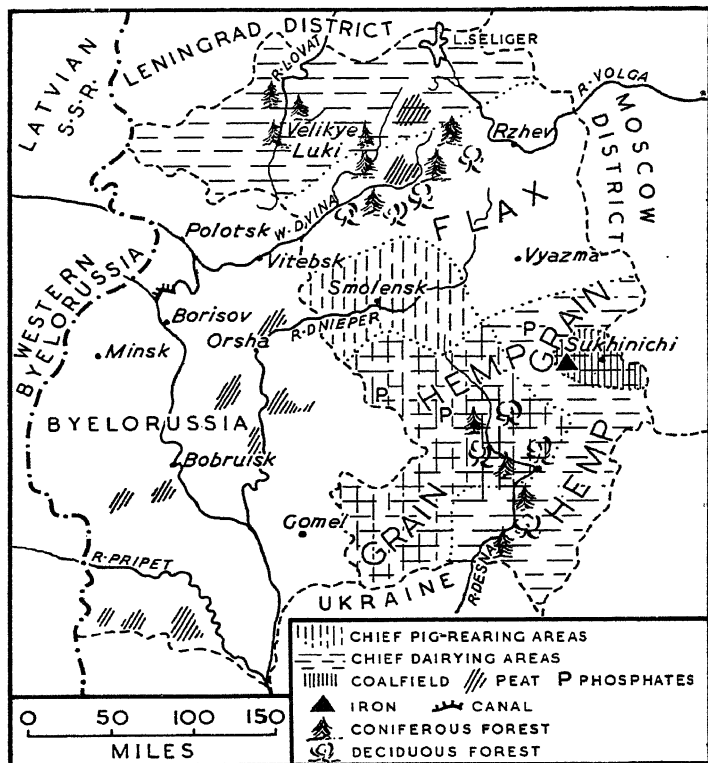


FIG. 58. THE WESTERN REGION

modern agricultural methods are compelling the soil to increase its yield. Local phosphatic deposits are used for the production of fertilizers, and the farms are highly mechanized.

¹ See note at p. 516.

In 1939, 4712 tractors and 695 combines (used for the flax harvest, which otherwise entails a great deal of arduous human labour) were in use in the Smolensk Region alone. The total sown area in White Russia alone increased from 6.2 million acres in 1913 to 10 million acres in 1937.

Flax, a crop more suited to the soils and climate, is grown on the damp morainic lands of the north. The best soils for both flax and vegetable cultivation are in the north-east, between Orsha and Moghilev, and near Minsk.

Hemp is an important crop in the south, in the marshy Polyessie lands, while the very large areas of poor sandy soils between these lands and the Bryansk district are devoted to potatoes, which supply fodder for hogs.

In the north-west (on the borders of the Kalinen Region) and near Bryansk hay crops and meadows provide fodder for large herds of dairy cattle. Grasses are sown in rotation with flax, since the latter makes heavy demands upon the soil. The rearing of cattle for meat and hides is an occupation which is widespread throughout the south. Large numbers of pigs are reared, fed on potatoes and waste products from the butter factories and distilleries.

In Byelorussia sown grass, potatoes, hemp, and flax occupy 40 per cent. of the total arable acreage. Oats and barley, grown as fodder crops, occupy about 60 per cent.¹ The Western Region supplies the linen industry of the Soviet Union with nearly 30 per cent. of its raw materials. A new crop, recently introduced with remarkable success, is the rubber-bearing kok-sagyz.

Forestry is of great importance. Although the area of forests is small in comparison with the great forest lands of the north, the species of timber are more valuable and the position in relation to markets is much more advantageous. Timber is exported to Poland along the West Dvina and the Niemen, and carried down the Dnieper and Pripet rivers to the treeless steppe lands of the Ukraine.

¹ The Western Region, particularly in the Byelorussian Republic, is the second most important potato-producing area of the U.S.S.R. The Leningrad Region and Byelorussia together support about 20 per cent. of the cattle of the Soviet Union.

Industry

In Tsarist Russia Byelorussia was one of the most backward agricultural regions, with practically no industry. In 1939 the factories of the Byelorussian S.S.R. produced twenty times the volume of commodities manufactured in 1913.

The Western Region as a whole is not well endowed with minerals. There are, however, phosphate deposits and large amounts of peat, while near Sukhinichi the south-western corner of the Moscow coal basin, yielding brown coal and containing iron of rather poor quality, extends into the Western Region.

Peat is used as fuel at the Bryansk, Osinovsk, Minsk, and Gomel regional power stations. Bryansk is the centre of an important metallurgical industry, which originally utilized ores mined near Sukhinichi, but eventually began to use supplies of cheaper metal brought by rail from the mines of the Ukraine. The largest locomotive and wagon-building works of the Soviet Union are situated in this town, as well as cement and glass works and saw-mills. At Gomel machinery for the cultivation, retting, and primary working up of flax is constructed. At Minsk and Vitebsk articles which require relatively small quantities of metal—lathes and needles, for example—are manufactured.

Throughout the remainder of the Western Region, industry is mainly concerned with the working up of agricultural products. The linen factories of Rzhev and Orsha are among the most important in the U.S.S.R. At Moghilev artificial silk is manufactured. Saw-milling and woodworking, including the making of veneers (at Bobruisk and Borisov), the making of matches (at Borisov and Rechitse), and the manufacture of paper, are all industries of national importance. Some of the largest Soviet paper and cellulose mills are situated at Bobruisk.

Of the remaining industries, the production of alcohol, starch, treacle, and acetone from potatoes, the manufacture of hemp (in the south), bristles, boots and shoes, butter, cheese, and bacon are the largest.

Vitebsk is the centre for a number of light industries such as textiles (linen) and knitted goods. It contains one of the largest knitwear factories in Europe. The tanneries of Vyazma can deal with one million pig-skins a year. Cotton-mills are situated at Yartsevo, near Smolensk, while at Klinty woollen cloth is produced.

Population and Communications

Smolensk grew up, early in Russian history, as an intermediary in trade and commerce between Kiev and Novgorod, on the route from the Varangians to the Greeks (see p. 142). When the Moscow State expanded nomadic invasions cut off most of the lands now in the Western Region from its domains, and later a large part of this territory was absorbed into the Polish-Lithuanian State.

These western borderlands became a battlefield between Moscow and Poland, a factor which retarded economic development. When eventually Russia obtained supremacy and control of the Baltic ports, and began to trade through them, a number of railway-lines were laid down, crossing the Western Region on their way to the Baltic from Moscow and the Ukraine. Thus to-day Smolensk and the few other large towns are situated at railway junctions (Fig. 59). The rivers and canals have in the past been important means of transport, and with the reconstruction of the old system of waterways their importance is likely to revive.

The dam which is to be constructed at Orsha will raise the level of the Dnieper and enable large river-steamers to sail into Smolensk, which is already important as the centre for the flax and dairy cattle region, and contains one of the largest flax-working mills in the U.S.S.R.

The most densely peopled areas are in Byelorussia. Although the main occupations are agricultural, the population is not small, since for long the farmers have had sure markets for food, and flax, hemp, etc., in the surrounding regions (e.g., the Moscow industrial region). In the north there is a marked concentration of population in the higher and better-drained land of the Central Russian Uplands and on the

morainic heights. Of the 9,000,000 inhabitants of the Western Region Byelorussians are in the majority in the west, Russians in the north and east, and Ukrainians to the south of the river Pripet. People of Polish origin are found throughout the region. After the unification of the Byelorussian Republic



FIG. 59. THE RAILWAY SYSTEM OF THE WESTERN REGION

by the addition of Western Byelorussia (see p. 512) the population of the Western Region was increased by about four and a quarter millions. Minsk, the capital of Byelorussia, lies at the junction between important railway-lines from Moscow and the Ukraine to Warsaw and Königsberg. It contains machine-building and wood-working factories. Gomel is situated at the point where the railway from Minsk to the Ukraine crosses the river Sozh, a tributary of the Dnieper. It contains metal and wood-working factories and glass works.

THE POPULATION OF THE WESTERN REGION
(1939)

Byelorussian S.S.R.

Urban	1,372,522
Rural	4,195,454
Total	<u>5,567,976</u>

Smolensk Region

Urban	447,996
Rural	2,242,783
Total	<u>2,690,779</u>

Orel Region¹

Urban	693,066
Rural	2,789,322
Total	<u>3,482,388</u>

Towns

Minsk	238,772	Moghilev	99,440
Vitebsk	167,424	Bobruisk	84,107
Gomel	144,169	Bryansk	87,743
Smolensk	156,677	Rzhev	54,081

The Central Region

The Central Region, although relatively small in area, has a population of about 28,000,000, and is the second most densely peopled part of the Soviet Union, the density of population being exceeded only in the Ukraine. This is mainly due to its central geographical position. The climate is less severe than in the north, but not so warm as in the south. It is wetter than in the lands lying further east, but not so wet as in those to the west. The region also occupies a transitional position between the zone of podsolized soils to the north of the Oka and the zone of black earths in the south.

NORTH OF THE OKA

The marshes and forests which originally covered the lands gave protection to the Moscow State during the early stages

¹ The western half only of the Orel Region is included within the Western Region. The former is an administrative, the latter a geographical division.

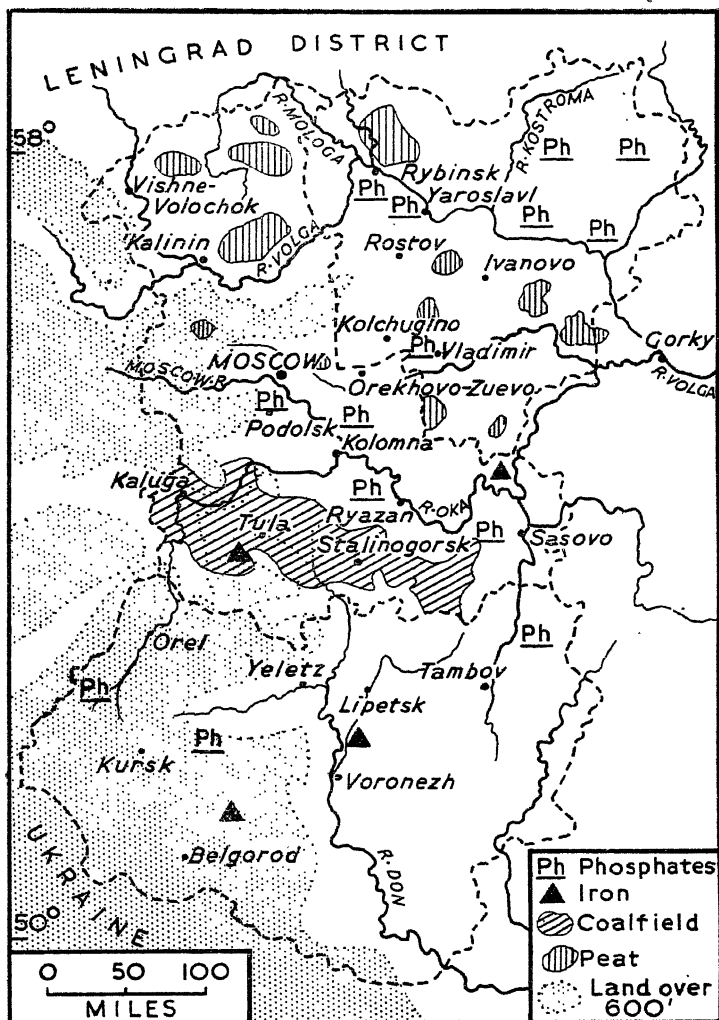


FIG. 60. THE CENTRAL REGION

of its growth, while the fact that the upper courses of the main rivers of European Russia flow through the region gave it enormous advantages in the control of trade and communications (see p. 146).

The northern part of the region is in the main a forested and marshy lowland, lying around the upper Volga and its tributaries, with a landscape of level or rolling plains, covered with sandy and clayey glacial and fluvio-glacial deposits. The river banks are smooth and flat, and as a result of the low relief the drainage system is poorly developed, so that vast areas are flooded in spring.

Settlements in the plain are confined to narrow sandy ridges on the banks of rivers and lakes. The remaining low-lying marshy country is very sparsely populated. To the north of Moscow are the chains of morainic heights, such as the Nevel and Valdai Hills, which extend from Smolensk beyond Moscow in a north-easterly direction. The Klima-Dmitrov ridge is the most notable elevation, rising to a height of 975 feet.

On top of the morainic heights the surface consists of an undulating plateau, deeply dissected.

In the north-west lies the Kalinin Region, where the Volga rises amid swamps and marshes, not far from Lake Seliger. This is the largest of a number of deep lakes which extend in a north-west to south-east direction—the direction of the advance of the Quaternary ice-sheets.

The West Dvina also rises at no great distance from Lake Seliger, while to the south is the source of the Dnieper, and to the north Lake Ilmen, and the river Lovat—leading to Lake Ladoga, the river Neva, and the Gulf of Finland. This was an important area of inter-river portages in the early days of Russian history, when Kalinin (then named Tver) was the centre of the important principality of Tver.

An interesting geological formation occurs along the upper Tver river, where a ridge of low hills rises 120 to 180 feet above the marshy plains, extending southward from Vishne-Volochok. Not far below the surface are red, grey, and blue clays (used in the manufacture of pottery and toys), together

with quartzite sands (used in the glass factories of Vishne-Volochok). But the most surprising feature is the presence of coal measures belonging to the Carboniferous period.

Deep borings made in 1927 proved that the Carboniferous strata do not constitute a broad, deep mass, but lie in the form of a huge tongue upon morainic clays and sand, and were probably transported hither by the waters from the melting ice-sheets at the end of the Great Ice Age.

The climate is similar to that of the Northern (coniferous forest) Region. The summer, however, is definitely warmer and longer. Precipitation is abundant, although not extremely heavy (see pp. 87-88). Since large areas of the country are forested, the winter snow cover tends to be preserved more than in the open southern steppe lands, where the winds sweep it from the ground. The retention of snow is of great value to agriculture since it protects the ground from severe frosts.

The soils are of the podsol type, with a clay and sand basis. The sandy soils provide favourable conditions for potato-cultivation. There are also considerable tracts of alluvial soils near the rivers. These support meadows which provide excellent pasture for dairy cattle. The natural vegetation changes from coniferous trees in the north to mixed forests in the south. Near Vladimir, in the north-west, there is a wide expanse of treeless country known as the 'Opolye.' Here the soils are dark and similar to the black earths of the steppe.

Unfavourable natural conditions for cereal growth, the thick forests, poor soils, and rains which often fall in late summer, retarded the early agricultural development of the Central Region, especially in its northern part.

From early times refugees from the adjacent lands flocked into this region when their lands were invaded, and as the soil could not support a large population, especially with the backward agricultural technique of those days, people were compelled to supplement their income by handicraft occupations. The central position of the region facilitated the exchange of handicraft products for raw materials and grain. Later, when the Moscow State became the centre of the

Russian Empire, raw materials such as flax, cotton, wool, and metal were brought in, the local supplies of timber were used as fuel, and the skilled craftsmen had greater scope for their work, many of them eventually becoming industrial workers.

Thus agriculture developed, not to secure a surplus for export or trade, but in order to meet the local requirements by providing milk, meat, and vegetables, and to supply industry with raw materials such as flax and potatoes. Grain had to be imported from the Ukraine. To-day technical advances in farming methods have almost removed this necessity, much of the food consumed by the population (even grain) being produced locally.

The most important agricultural regions are indicated in the succeeding paragraphs.

The Northern Flax and Dairy Cattle Region. Flax, a suitable crop for the poor soils and cool damp climate, is combined with grasses, sown in rotation, in order to restore the fertility of the soil, upon which flax makes heavy demands, and to provide fodder for dairy cattle reared for milk production near the towns, and for butter in the north, where there is no market for milk (*e.g.*, in the Ivanovo Region). Flax¹ and grasses occupy about one-half of the sown area. Vegetables and potatoes are widely grown, the latter on the sandy soils. In the extreme north-east, however, owing to the extreme climatic conditions, there is only a small amount of agriculture.

The Milk, Potato, and Vegetable Region. This includes the lands around the central industrial region, and extends eastward towards Yaroslavl, Ivanovo, and Gorki. In the Rostov-Yaroslavl district potatoes occupy up to 40 per cent. of the sown area. Elsewhere large quantities are grown on sandy soils. In the Moscow Region a greater proportion of arable land is under potatoes than in any other part of the U.S.S.R. Fodder crops (for dairy cattle) occupy about 16 per cent. of the sown area, while a similar proportion is devoted to market-garden crops.

¹ The Kalinin Region alone produces more flax than the whole of Western Europe, this crop occupying 16 per cent. and potatoes 10 per cent. of the sown area of the region.

The Suburban Market-gardening Region. This zone, which includes the country close to Moscow, specializes in the production of milk and vegetables for the urban population. Pigs and rabbits are reared, a considerable proportion of the fodder being obtained from the waste food from restaurants and factory kitchens in the towns.

The Southern Cereal and Potato Region. Here the climate is milder than in the north and the soils are rather more fertile. In the regions described above winter rye and oats are grown to meet local requirements. Within this zone, however, not only is there a larger area under grain, but winter rye and oats are replaced by winter wheat. Potato-cultivation is important, too, as a basis for pig-breeding, and as a raw material for starch and treacle factories, distilleries, and the manufacture of synthetic rubber. Poultry farming is also carried on.

THE BLACK EARTH LANDS OF THE SOUTH

South of the Oka the relief changes. To the west the land rises in the Central Russian Uplands. In the east lies the Tambov Plain, the southern section of the Oka-Don Lowland, covered with a meandering and complex river-net, cut deeply into the valleys. The right banks are steep, while on the left banks there are broad meadows.

The watersheds between the rivers are dissected by ravines and gullies, which are a prominent feature of this region. Their extension and growth are assisted by the ease with which the loess surface is washed away, especially where man's activity has resulted in the clearing of the protective cover of forests, or in the ploughing up of the land on the hillsides. In the past a great deal of arable land was lost to the farmers in this way, and it is only within recent years that serious steps have been taken to combat this menace to agriculture by the planting of trees along the edges of the ravines.

The winters are severe, but as a result of the southerly latitude of this part of the Central Region, the summers are warm and long. The spring, too, comes earlier, and is milder

than in the north. During some years, however, dry south-easterly winds bring about rapid evaporation after the thaw, so that the moisture from the melting snow has not time to soak the soil. This causes serious difficulties for agriculture. Precipitation is generally sufficient and decreases in a south-easterly direction. Heavy rains often fall during early summer. During the latter half of this season, however, the weather is dry and conditions are good for harvesting.

The original deciduous forest vegetation which formerly covered the northern section of these lands has been largely cleared so that to-day it remains chiefly along the sides of the valleys. On the drier sandstone and limestone formations, especially on the banks of the Oka, there are areas of steppe. Towards the south-east, deciduous forest changes to wooded steppe and finally to true steppe.

The soils are black and fertile, and combine with the climate to produce favourable conditions for agriculture. More of the land is devoted to crops than in the north of the Central Region, and in place of dark and sombre masses of forest which obstruct the view, open fields, green with young spring crops, or a golden sea of waving corn in summer, extend to the horizon, broken only by islands of trees. The sky is less cloudy, and seems higher and a deeper blue. In fact, the landscape becomes strongly reminiscent of the neighbouring Ukrainian steppe lands. It must be remembered, however, that some of the country now under the plough, although having the appearance of original steppe country, was formerly wooded, especially towards the north, as is evident from the soils, the so-called "degraded black earth," which contain less than 6 per cent. of humus, while the true steppe can be recognized by the presence of soils containing up to 10 per cent. of humus.

Until the end of the sixteenth century this southern section of the Central Region lay on the route of the nomads, when they invaded the Moscow State. When the invaders were eventually driven back the land was divided into large estates and given to military people. With the land went the peasant serfs. After the abolition of serfdom and the enclosure of

much of the land by landlords and nobles there was a large landless peasantry which provided a reservoir of cheap labour. Hence there was no incentive to introduce machinery, and agricultural technique remained in a backward condition.

When the Ukrainian lands of the south were connected to Moscow by railway they provided cheap and abundant supplies of grain, since the virgin soil, untouched for centuries, yielded rich harvests without the employment of fertilizers. This brought about the final economic collapse of the southern lands of the Central Region, and wholesale emigration of the peasants took place. Many went to seek work in the Urals, or to settle in the empty lands across the Volga.

After 1917 modern methods of farming, the establishment of large mechanized farms, the application of fertilizers, and an increase in the area under cultivation brought about a great improvement. The number of industrial crops such as beet, sunflower, tobacco, hemp, and potatoes, as well as the area sown to fodder crops (the basis of dairy cattle and pig- and poultry-rearing), rapidly increased. The value of this procedure lay in the presence of an industrial market close at hand (in the Moscow district).

To-day it is possible to distinguish four agricultural regions.

(1) In the south-west (the Kursk Region) the precipitation is relatively high, and the climate relatively warm. Sugar-beet is the main crop, and this region is now the second most important source of sugar in the Soviet Union. Market-garden crops are grown and pigs and poultry reared. (2) In the drier lands of the south-east the farms specialize in winter wheat, millet, rye, oats, and sunflower. About 15 per cent. of the sown area is under wheat in the Voronezh Region as compared with 10 per cent. in the Kursk Region. Pigs are reared, and in the south of the Voronezh Region, sheep. (3) In the damper and cooler north-west (Orel Region) the cultivation of hemp and the rearing of dairy cattle are highly developed. (4) The remainder of the north, in which conditions of soil and climate approximate to those obtaining north of the river Oka (and described below), is devoted to the growing of fodder and potatoes and to pig-breeding, with

some grain and sugar-beet in the southern part of the Tula, Ryazan, and Tambov regions.

Considerable areas are devoted to potatoes in the Kursk and Voronezh regions. Cattle and pigs are reared in each of the four areas, rye and oats, sown grass, and the waste products of agriculture, such as sugar-beet waste, and stubble being used for fodder. Around all the large towns vegetable- and milk-production form the chief agricultural occupations.

Industry

An explanation of the early development of the handicraft industries, and the subsequent establishment of industries engaged in the working up of agricultural produce, such as flax, cotton, wool, and metal, has already been given (see p. 537). Industry developed not because of an abundance of local raw materials, but because of the central geographical position in the midst of one of the most densely peopled parts of the Soviet Union and hence close to the great consuming centres. The Kalinin Region, for example, was in a particularly favourable entrepôt position, between Moscow, Leningrad, and Southern Russia, and it was rendered more favourable when, during the time of Peter the Great, the rivers were connected by canals.

The lack of local supplies of high-quality coal and iron, and hydro-electric resources, tended to retard the development of the heavier industries. But within the last twenty-five years the brown coal of the Moscow basin has been utilized, in addition to coal from the Donbas and oil from the Caucasus. The output of the Moscow basin had risen to 7,400,000 tons a year by 1938. After the coal has been burned the ashes, together with sulphur and other substances found in brown coal, are utilized by the chemical industry.

Peat, too, is extensively employed as a fuel. There are large regional peat-electric-power stations at Yaroslavl, Orekhovo, Ivanovo, and Shatura, while those at Kashira, Bobriki, and Stalinogorsk use brown coal.

In the Kalinin Region there are now 125 electric-power

stations, while the Moscow district alone possesses greater supplies of electrical energy than any other industrial region in Europe. About two-thirds of the fuel used in power stations and industry is produced locally.¹

Iron has been mined in Tula since the time of Peter the Great, and is to-day used in the engineering works and iron-ware factories near the town.

The iron deposits of Kursk² and Lipetsk are now being utilized (*e.g.*, at the Lipetsk metallurgical works). Other deposits of iron occur along a line extending approximately from Kaluga to Murom. But up to the present the local supplies of iron ore in the Central Region have not been great, and the machinery and engineering industries which have been developed are in the main those which require relatively small amounts of metal and large quantities of skilled labour—as the

Russians say, “metal for a kopeck, and labour for a rouble.” Scrap-iron and imported ores from the Ukraine are used for the production of high-quality steel at Moscow and Noginsk. Thus we may say that the iron and steel region of the Moscow district was founded in order to supply the engineering industry, in contrast to the Urals Region, where iron- and steel-production were established first, and on the basis of this the engineering industries came into operation at a later stage.

The majority of the engineering works, mainly engaged in the production of machine-tools, instruments, lathes, ball-bearings, motor vehicles, printing, textile, agricultural, transport and electrical machinery, are situated either in Moscow or in the neighbouring towns. The manufacture of machine-tools, and a large proportion of the motor vehicle industry, is

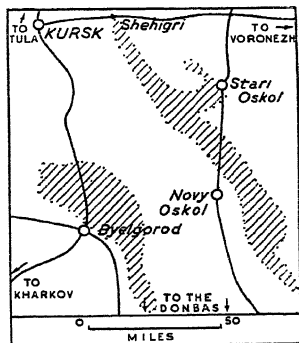


FIG. 61. THE KURSK IRON DEPOSITS

¹ In 1939 two new hydro-electric stations on the Volga were nearing completion, one at Uglich and the other at Rybinsk.

² See p. 238.

concentrated in Moscow itself. At Kolomna locomotives are constructed, at Mytishi railway-wagons and coaches, tram-cars, and agricultural machinery.

Farther away from Moscow, at Kalinin, railway-coaches and wagons are built. At the Kalinin railway works 28 per cent. of the passenger coaches and 16 per cent. of the wagons used on Soviet railways are built. The growth of heavy industry in the Kalinin Region as a whole is reflected in the relative decline of the older light industries, the output of which has been reduced since 1917 from 70 per cent. to 45 per cent. of the total industrial production.

The factories of Yaroslavl specialize in synthetic rubber, motor vehicles, and agricultural machinery. The latter is also manufactured at Torzhka. Heavy as well as light industry has also been extended to the Ivanovo district. Ships and printing machinery are made at Rybinsk, machines for the peat-extracting industry at Ivanovo, precision instruments at Vladimir, and non-ferrous metals are refined and smelted at Kolchugino. In the south, agricultural and textile machinery is made at Voronezh.

The textile industry, however, is the most important. In and around Moscow, and to the east, in the Orekhovo-Zuevo district, cotton fabrics, woollen, silk, linen, and a variety of knitted goods are manufactured. Kalinin and Vishne-Volochok are smaller cotton textile centres. The Kalinin Region as a whole, however, is an important linen-manufacturing area, accounting for a considerable proportion of the entire production of the U.S.S.R. The chief centres of manufacture are Rzhev and Bezhetska. The textile industries of the Moscow district are now tending to specialize in the manufacture of fabrics of high quality, as well as in special fabrics required for the machine-building and chemical industries. This is because new mills have been constructed in Central Asia, Transcaucasia, and Western Siberia, as part of the plan for a more rational distribution of industry, placing the factories nearer the sources of raw materials.

Ivanovo, however, is still the "Manchester of Russia," and not only are there important cotton-mills in the town itself,

but it is also the centre of a group of cotton-manufacturing towns, which in turn are surrounded by a second ring of linen-manufacturing towns (Fig. 62). Other industrial enterprises—chemical works, producing acids and dyes, engineering works, starch factories, etc.—provide the textile

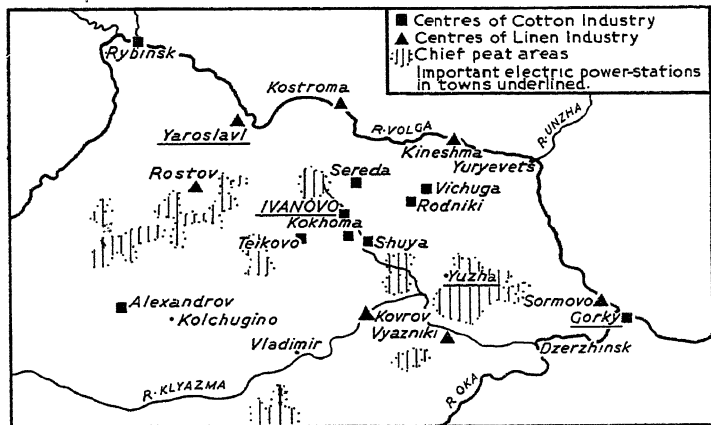


FIG. 62. THE IVANOVO TEXTILE REGION

industry with essential requirements. To the north-west of Ivanovo, in the Yaroslavl Region, there are linen factories at Yaroslavl and Kostroma.

Handicraft industries are still maintained in artels—linen-weaving near Vyazniki, cotton-weaving near Alexandrov, and the making of sheepskin coats at Shuya.

The Ivanovo district has no local supplies of coal, and peat and wood constitute a large proportion of the fuel used in the industrial undertakings and power stations. Electric power is also transmitted from the Moscow and Gorki districts.

Within recent years the chemical industry has undergone enormous development, especially in the Moscow district, where dyes are manufactured for the textile mills. The chemical works of Voskressensk, Stalinogorsk, and Dzerzhinsk

produce nitrogenous and phosphatic fertilizers. Local deposits of phosphates and brown coal are used.

An entirely new industry is engaged in the production of synthetic rubber from potatoes (see p. 246) at Yaroslavl, Efremov, Kursk, Voronezh, and Tambov. Rubber is manufactured at Yaroslavl, where the tyre-works has a capacity of 8,000,000 motor-tyres per year, and a variety of rubber goods is produced in Moscow.

The forests of the Moscow district have been cleared to such an extent that the Government has introduced legislation forbidding the cutting of trees in certain protected zones. Hence the surrounding areas, such as the Ivanovo district, produce most of the timber for local requirements, as well as exporting it to other parts of European Russia. The wood-working industry is carried on at Kalinin, Vishne-Volochok, Ryazan, Sasovo, and along the Volga and its tributaries in the Ivanovo and Yaroslavl Regions.

The majority of the minor industries are engaged in the working up of agricultural material—the leather, boot, and shoe industry (in the Kinry-Taldom district), and boot-fulling (near Kalagin). Potatoes provide the basis for the production of starch, treacle, and alcohol.

It will be noted that practically all the industries described above are situated in the northern part of the Central Region. In the south farming is the dominant occupation, and most of the industries (beet-sugar,¹ butter, starch, treacle, and tobacco production, flour-mills, and distilleries) depend upon agriculture for raw materials.

The significance of the Central Region, and especially the Moscow district, in the economy of the Soviet Union as a whole cannot be over-estimated. More machines are produced in the Central Region than in Italy, Japan, and Poland together. The Moscow district is the most highly developed industrial region of the Soviet Union, as the figures at p. 547 show.

The Ivanovo Region is the fourth most productive indus-

¹ The Kursk and Voronezh Regions produce about 15 per cent. of the granulated sugar manufactured in the U.S.S.R.

trial region of the U.S.S.R. (In 1937 nearly 40 per cent. of the production of cotton fabrics was concentrated in this region.) It holds first place in the manufacture of linen, and is second only to Moscow in the production of cotton cloth.

INDUSTRIAL PRODUCTION OF THE MOSCOW REGION
(1937) AS PERCENTAGES OF THE TOTAL PRODUCTION
OF THE U.S.S.R.

Cotton fabrics	.	.	.	.	47.5
Peat	.	.	.	.	26.8
Metal-working industries	.	.	.	.	24.8
Electric power	.	.	.	.	14.4
Pig-iron	.	.	.	.	4.1

Transport and Communications

Reference has already been made to the central geographical position of the Moscow district around the upper courses of several important rivers. To-day the Volga is Russia's chief waterway, and its value to the Moscow district has been greatly increased by the construction of the Moscow-Volga Canal, and the establishment of deep waterway navigation along the entire length of the river. Its value will be enhanced still further when the "Great Volga" scheme has been finally completed. The reconstruction of the Vishne-Volochok canal system (Fig. 63), originally built between 1703 and 1708 and of great commercial importance up to the nineteenth century, will open the Volga-Leningrad route to larger vessels, which will then be able to proceed from the Caspian Sea up the Volga, along the Moscow-Volga Canal to Moscow, and thence to Leningrad.

Another shorter waterway which is being reconstructed is from Yaroslavl along the river Sheksna and the Mariinsk system to the Baltic-White Sea Canal or Leningrad.

The new Moscow-Volga Canal (80 miles in length) has been in operation since 1937. It commences at Kimri on the Volga, and after traversing a marshy lowland cuts through the Dmitrov-Klim morainic ridge (by means of a series of locks) to the Moscow river. At Kimri a huge reservoir has been constructed, from which part of the water is directed

for the express haulage of coal from the Don basin. Recently a number of modern motor-roads have been constructed,

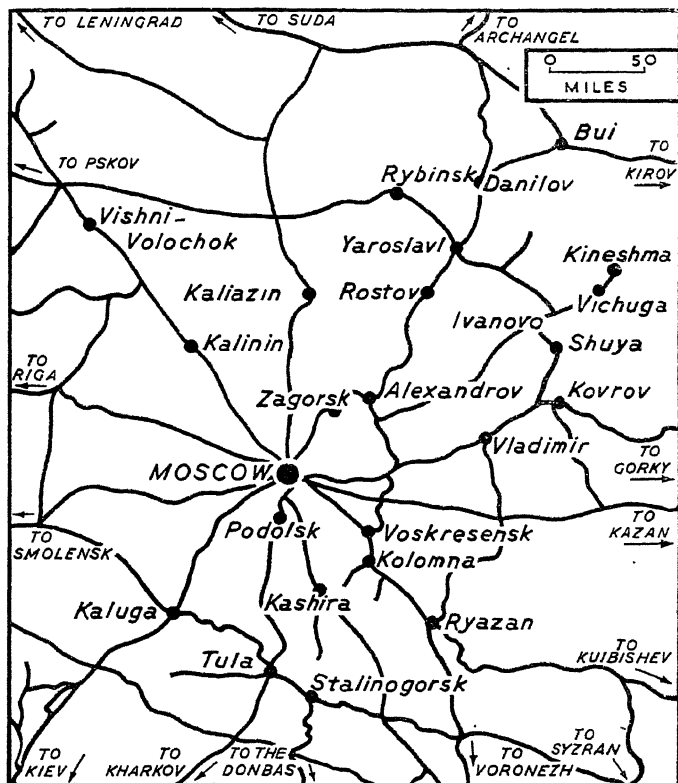


FIG. 64. RAILWAY ROUTES OF THE MOSCOW DISTRICT

radiating from Moscow to Minsk, Kiev, and other large towns. The Moscow Region as a whole is better served by railways and modern roads than any other part of the Soviet Union.

Thus the Moscow Region is excellently served by transport

arteries along which coal, metal, oil, timber, wheat, sugar, cotton, and silk are carried to the large urban and industrial centres.

The Volga plays a major rôle in the economy of the Ivanovo Region, which it bisects, separating the lightly populated north, where soils are poor, the climate severe, and agriculture difficult, from the more populous south. Cotton from Central Asia, metal from the Urals, and coal from the Donbas are carried along the river to the factories of the Ivanovo and Moscow districts. A large number of industries depend directly upon the Volga for supplies of raw materials from other parts of the Union and as a means of dispatching finished goods. Prominent examples are the shipbuilding industry, flour-milling at Rybinsk, and oil-refineries at Yaroslavl and Konstantinovka, to which oil is brought in tankers from Baku. Grain is shipped up the Volga from the steppe lands of the south. Finally, timber from the northern forests is carried downstream to the south, where there is a deficiency of wood.

*Population and Cities*¹

Approximately 12 per cent. of the population of the Soviet Union—nearly 9,000,000 people—is concentrated in the relatively small area of the Central Region. Some 95 per cent. of the population is Russian. There are, however, several 'islands' of Tartar and Mordovian peoples.

There are ten administrative regions. Four (Moscow, Kalinin, Ivanovo, and Yaroslavl) are in the north, and two (Kursk and Voronezh) in the southern black soil lands.

In the Moscow district the density of population is higher than in any other district of the Soviet Union. The Voronezh and Kursk districts are also exceptionally densely peopled.² In contrast, the lands in the districts of the north, possessing

¹ For the population of the Central Region, see p. 610. (Kalinin, Moscow, Tula, Orel, Kursk, Voronezh, Tambov, Ryazan, Ivanovo, and Yaroslavl Regions.)

² The dense agricultural population of the black earth lands is reflected in the average area per peasant household on the collective farms—25 to 27 acres (in 1938) in the Orel, Kursk, Tambov, and Voronezh Regions, as compared with 82 in the German Volga Republic, and 99 in the Chelyabinsk Region.

neither a good geographical situation for the development of industry nor favourable conditions for agriculture, are very scantily peopled.

The contrast between the predominantly industrial occupations of the Moscow, Ivanovo, and Yaroslavl Regions in the north, where conditions do not assist agriculture, and the southern black soil lands is clearly reflected in the percentage of the population classed as urban in the 1939 census—50 per cent. in the Moscow district, over 30 per cent. in the Ivanovo and Yaroslavl districts, but only 11·5 per cent. and 8·5 per cent. respectively in the Voronezh, Orel, and Kursk districts. In the latter there are only two large towns, Kursk and Orel, and each of these contains less than 200,000 inhabitants.

In the south the greater part of the population is concentrated in villages near sources of water—strung out for miles along river-banks and dry valleys, as in the Ukrainian steppe.

Practically all the cities of the Central Region are of ancient origin, especially in the north. This is a clear illustration of the important position of these lands in the historical development of the Moscow State (see p. 144). Some of the towns, such as Rostov and Suzdal, were important in the Middle Ages, but have deteriorated since that period to the status of villages.

Moscow, the capital city of one-sixth of the world, and the largest industrial and cultural centre of the Soviet Union, has a population of 4,500,000. It thus ranks as one of the chief metropolitan cities of the world. Founded eight hundred years ago, Moscow occupied a well-protected position on the high bank of the Moscow river, protected by that river and a smaller tributary, as well as by the surrounding forests and marshes.

The ancient fort, the Kremlin, contains massive stone buildings—palaces and churches—around which strong walls were built during the fourteenth century. Outside these walls a village of wooden buildings grew up, and these in turn were protected by a new wall, the “Chinese Wall” of the sixteenth century. The power of the Moscow State grew, and its territories increased in size, for there was no obstruction

between the town and the great waterways of the Volga, Oka, Don, and Dnieper. All main routes converged on "Mother Moscow," just as to-day the railways converge upon it. The population of Moscow, the centre of trade and commerce, rapidly increased. The original city became too small, and new settlers had to build their dwellings and carry on their business outside the Chinese Wall. Eventually a third wall—the "White Wall"—was built to enclose these new settlements.

At the end of the sixteenth century Moscow was attacked by Tartar invaders, and in order that any further attacks might be repelled, another rampart was constructed from wood and earth.

Although Peter the Great, when he decided that Russia must be brought into commercial contact with the rest of the world, transferred his capital to the port of St Petersburg, Moscow continued to grow. During the eighteenth century the first industrial undertakings—textile factories engaged in producing linen and woollen fabrics for the army and navy—were established, and Moscow became not only a city of merchants but also an industrial centre. Later, when railways were constructed, it became the centre of the entire Russian railway system—a factor which greatly stimulated industrial expansion.

More textile factories were built, mainly along the banks of small streams, and later the metallurgical industries were introduced. In spite of all this industrial growth, however, Moscow retained the appearance of a great Asiatic village even up to 1917. Three-quarters of the buildings were of wooden construction, roads were in a primitive condition, and sanitation, lighting, and other such civic amenities were almost entirely absent.

In 1917 the population was 1,618,000. After 1917 the capital of the new Soviet Union was transferred to Moscow, and the city became the nerve-centre for the large-scale industrial and economic planning of the vast territories of the U.S.S.R. As the agriculture and the industries of the country began to expand, the industries of Moscow also

increased in size.¹ Many new factories were built, together with large blocks of offices and administrative buildings, and housing estates for the accommodation of the workers who flocked to the capital in thousands. The population had

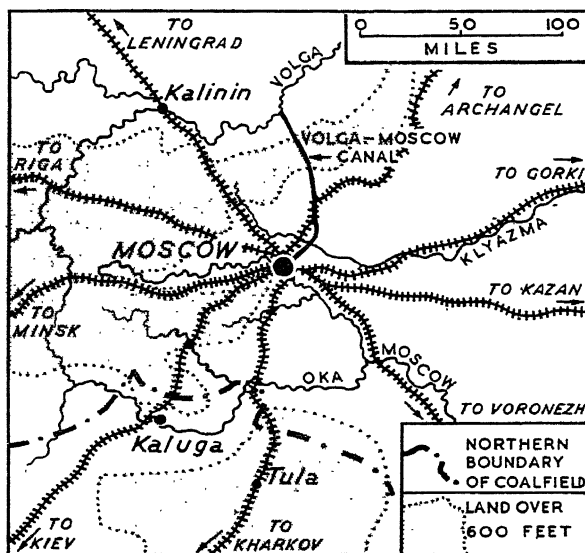


FIG. 65. THE POSITION OF MOSCOW

increased to over 2,000,000 by 1926, to more than 3,500,000 by 1933, while in 1939 it exceeded 4,000,000.

In 1933 a "Ten-year Plan" was initiated for the complete replanning and reconstruction of the city. A large proportion of this plan had been executed when the Soviet Union was attacked by the German Army in 1941. According to the plan, which included industrial development as well as reconstruction, the population would have increased to 5,000,000 by 1945. Already, in 1939, Moscow had been

¹ About one-seventh of the industrial production of the U.S.S.R. is concentrated in Moscow.

transformed into a beautiful city, with modern buildings, theatres, green belts, parks, and other cultural amenities.

The Kremlin still stands, surrounded by the old stone walls, and overlooking the Moscow river, now a deep, navigable waterway, with granite embankments and spanned by several splendid modern bridges. The old walls which surrounded the city have been taken down, and broad circular boulevards laid out, intersected by wide roads which radiate from the centre like the spokes of a wheel. Modern Moscow is served by an excellent system of trams, buses, and trolley-buses, and a new underground railway which technically and artistically has set an example to the capitals of the world.

The industrial settlements are grouped in zones around the periphery of the city, separated from it and from one

POPULATION STATISTICS

Moscow Region			
Urban			6,268,331
Rural			2,650,000
Total			8,918,331
Moscow			4,137,000

Kalinin Region			
Urban			702,704
Rural			2,508,735
Total			3,211,439

Tula Region			
Urban			711,240
Rural			1,338,710
Total			2,049,950

Ryazan Region			
Urban			218,797
Rural			2,047,046
Total			2,265,843

Chief Towns

Tula	272,403	Kolomna	75,139
Kalinin	216,131	Podolsk	72,422
Ryazan	95,358	Lipetsk	66,625
Sherpukhov	90,766	Volochok	63,642
Noginsk	81,024	Yegorevsk	56,340
Stalinogorsk	76,207		

another by green belts. In addition to the chemical, textile, and engineering works there are factories engaged in the manufacture of clothing, knitted goods, and footwear, while the Moscow meat combine is the largest factory of its kind in the world, and is only one of a number of considerable undertakings engaged in the food industry.

Moscow is, therefore, well supplied with transport facilities, food, and an abundance of pure drinking water (from the Kimri reservoir). This city is regarded by the people of the Soviet Union as a monument to their creative activities in the past twenty-five years, and a symbol, indicating the great possibilities which the future holds for them, of that concept of planned geography and economy which has been extended to the entire territory of the U.S.S.R.

The Baltic Republics

Before the Russian Revolution the three present Baltic republics of the Soviet Union—Estonia, Latvia, and Lithuania—were within the Russian Empire. The Estonian people are of Finnish stock, and their language is closely related to that spoken in Finland. In Latvia and Lithuania, both Alpine and Nordic racial types are intermingled—broad-headed, dark-haired elements, and long-headed fair types, the latter being found mainly in Latvia. The exact racial origin of these peoples is not, however, at all clear, and their language is neither Finnish nor Slavonic. It belongs to the Indo-European group, and contains many archaic peculiarities. Close to the Russian frontier which existed up to 1939 the population is predominantly Slavonic.

In the social structure of these three countries German landowners—the “Baltic Barons”—have played an important rôle since the thirteenth century, especially in Latvia and Estonia, which had never been completely independent states prior to the end of the Great War.

These Baltic Barons settled as owners and overlords, exploiting the peasantry until, after the Russian Revolution, their estates were confiscated. In Lithuania the landowners were

mainly Poles. Before the union with Poland in the fourteenth century Lithuania controlled territory extending almost to the Black Sea. After becoming united with the old Polish Empire it suffered extinction as a state, together with Poland, when all Polish-controlled lands were partitioned among the neighbouring Powers during the eighteenth century. When the Polish State was re-created after the Great War memories of the early union between the two countries still prevailed in Polish Government circles, and in 1921 Poland annexed the historic Vilna district.

Throughout the long period during which the present Baltic republics were parts of the Russian Empire their economy developed naturally in close harmony with that of the rest of Russia, to which they were, and are, bound for strong strategic, economic, and geographical reasons.

The Baltic region provided an important seaboard for what was originally a land-locked state, and its loss after the Great War shut off the greater part of the Soviet Union from the Baltic, and limited her naval power.

Early in the history of Russia her rulers attempted to establish ice-free ports, without which easy access to Western Europe was impossible. The harbours of the Baltic are almost ice-free, while Leningrad is icebound for about three months of the year. After the war with the Swedes Peter the Great obtained Estonia (with Reval and Narva) and Livonia, or Northern Latvia (with Riga). Southern Latvia and Lithuania were annexed after the defeat of the Poles (1794-95), during the reign of Catherine, thus finally establishing Russia on the Eastern Baltic. Swedish troops were next driven from Finland, and a treaty concluded in 1809 by which Russia obtained Finland and the adjacent islands. In this way control of the Northern Baltic was secured.

The importance of these Baltic States for the defence of the great industrial centre of Leningrad has been demonstrated not only during the present war. During the Great War, and the Wars of Intervention against the Soviet Union which followed, the German invasion of the Baltic States was designed as the prelude to a blow aimed at the city from the

south, while German forces in Finland opened the way for an attack from the north.

Although after Germany's defeat in 1918 she evacuated her troops from the Baltic States, the Soviet States set up in Estonia and Latvia were suppressed by the forces of inter-



FIG. 66. THE BALTIC REPUBLICS

vention and together with Lithuania became independent states. Thus in a very short time Russia lost her chief means of access to the Baltic and her barriers against any future attack on Leningrad.

At the conclusion of the Russo-Finish War (February 1940)

a small portion of Finnish territory was transferred to the Soviet Union, most of it being included in the new Finnish Karelian Republic (see p. 563). Before the German invasion of the U.S.S.R. in 1941 the U.S.S.R. had obtained the right to establish garrisons in the Baltic States, which eventually elected to become incorporated in the Soviet Union as Soviet Republics, retaining their own governments. The Vilnius district was restored to Lithuania.

The strategical considerations outlined above, which bring the Baltic republics to the U.S.S.R., are the direct outcome of the fact that the Baltic countries consist of an extension of the Russian Plain, not separated from the main mass by any natural defences or physical barriers. This factor has had important economic consequences, which have created even greater ties, outlined below, between Russia and the Baltic lands.

The Plain here forms part of the great Baltic moraine zone (see p. 32), with a landscape of morainic hills with glacial lake basins and boulder clay and sandy lowlands between them, and occasional plateaux of Palaeozoic rocks, only partially or not at all covered with glacial material. The low plateau of Estonia, and the islands off the coast which form remnants of it, were denuded of soil by the advancing ice during the Great Ice Age. It is separated by a depression filled with glacial sands and gravels, from the Livonian Plateau to the south. Along the eastern frontier of Estonia is Lake Peipus, drained by the river Narva. Where the river falls some twenty feet at Narva, near its mouth, a hydroelectric station has been built. Lake Peipus itself is in a large glacial lake basin, with a floor of sands and clays. It extends along the eastern edge of the plateau towards the West Dvina river. Glacial lake deposits also occur around the Gulf of Riga, itself once a lake-bed, and along the western border of the Livonian Plateau. The soils of the lake-beds and depressions are relatively fertile, while those of the plateaux are poor. The eastern part of Latvia contains considerable portions of end-moraine country, with numerous lakes, marshes, and poor, forest-covered soils. Lithuania is largely occupied by the basin of the important river Niemen.

Southern and Eastern Lithuania is traversed by lines of morainic hills, which continue north-east towards the North Dvina river. The centre of the country is occupied by a plateau, covered in part by a zone of end-moraine deposits. Along the coast is a region of ground moraine.

The glacial deposits have produced soils not exceptionally favourable for agriculture. Peat and bogs cover 15 to 20 per cent. of the land. Being nearer to the Atlantic than the interior of the Russian Plain, the climate is milder but damper than that of European Russia—a climate which, combined with the poor glacial soils, favours forest growth, dairy farming, and the cultivation of rye, oats, barley, potatoes, and flax. Agriculture has for long been in a backward state in all the Baltic republics. Dairy farming for bacon, eggs, and butter export has made the greatest advances.

Industrially too the Baltic States were backward. For a market for both agricultural and industrial products they have always depended largely upon Russia, and the fact that the low plateau and glacial topography creates no barrier to economic intercourse led in the past to the importance of these countries as controllers of the transit trade in Russian exports through the ice-free ports. When they became separated from Russia both the Russian market and the transit trade were lost. At the same time the rather poorly developed industries could not compete on other markets with the more technically advanced countries of the world. Hence industrial development suffered. Although the absence of useful minerals (apart from clays and combustible oil shales, found near Lake Peipus) restricts industrial growth, there are considerable possibilities for the manufacture of paper, plywood, and timber products. These branches of industry have, in fact, been developed since 1918.

ESTONIA

Estonia has made the most progress since the Great War. Of the land, 23 per cent. is arable, 41 per cent. meadow and pasture, 20 per cent. forest land, and 16 per cent. waste land,

bogs, and lakes. The acreage under the main grain crop, rye, has decreased with the development of dairy farming for export.

Oil shale quarried on the plateau in Northern Estonia is used as a fuel in factories, for central heating, on the railways, in the cement-works at Port Kunda and Azeri, and for the production of fuel oil at Kohtla. Coal, however, must be imported to supplement the shale and oil fuel.

Industries declined when the Russian market was lost, but began to revive rapidly when Estonia became a Soviet Republic. Leather, paper, and linen were manufactured in several towns before the present war.

Tallinn (Reval), with a population of 134,000, owed its development to the fact that it was one of Russia's Baltic ports, with a large transit trade. The port can be kept open by ice-breakers through the greater part of the winter. It has iron- and steel-works, cotton-mills, and grain-elevators.

Baltiski was developed as a port because it is obstructed by ice for a shorter period than Tallinn. Pernau (22,000), on the Gulf of Riga, is the chief centre of the woollen industry, and exports timber and flax. Narva, with its cotton-mills, using hydro-electric power from the Narva Falls, exports timber. The lumber industry is important throughout the Baltic States.

In the upland districts of Estonia the Primary rocks produce poor soils. Where they are covered by morainic material wooded ridges stretch across the country. The rivers, where they flow from the plateau into the lakes in the east, possess considerable reserves of water-power. The only town of importance in Central Estonia is Tartu, or Dorpat (67,000), the chief market-town of the area. It is also a centre for the timber and pulp industry. (For population see p. 563.)

LATVIA

The coastal lowland of Latvia forms a broad, fertile region developed on glacial soils around the Gulf of Riga (see p. 558). The chief crops are oats, barley, rye, and potatoes. Dairy farming is an important occupation. Before Latvia's separation from Russia the Latvian dairy produce was added

to the butter, eggs, flax, hides, and cereals from Russia to form a great volume of export trade. Riga (378,000) was the main port, and was the chief market for timber from White Russia and Volhynia (Western Ukraine). It has timber, textile, metal, and rubber industries, and exports flax, butter, and eggs. Navigation can be maintained by ice-breakers until December, when the shallow gulf freezes over.

Liepaja (Libau) and Ventspils (Windau) are practically ice-free, and were outports for Riga's transit trade from Russia.

In the forested morainic heights of Courland lumbering is the main occupation, while the valley lands of the Lielupe (Aa) and West Dvina (Daujava) support arable land devoted to wheat and flax and considerable areas of pastureland.

The Palæozoic uplands of Eastern Latvia contain considerable areas of Primary limestone surface rocks. About 10 per cent. of the land is devoted to flax. Barley is an important crop, and cattle are reared for meat-production.

Latvia, like Estonia, has developed dairy farming to a considerable degree, exports of butter after the Great War rising to ten times the pre-war figure. On the other hand, the export of timber from Russia suffered when Latvia became an independent state. The loss of the Russian market brought about the extinction of the large industries, which were replaced by small establishments working for the home market. Industrial production declined by 82 per cent. between 1913 and 1939. Since some 60 per cent. of industry was situated in Riga the re-establishment of contact with the natural hinterland of Russia is certainly of great economic value to the port.

Before Latvia's entry into the U.S.S.R. the chief industries were the timber, pulp, match, cotton, linen, and leather industries.

Although Latvia possesses no coal, the rapids at Koknese (on the limestone escarpment) could be utilized to supply a large amount of hydro-electrical power.

When Latvia became a Soviet Republic plans for rapidly increasing the industrial output of the country were immediately drawn up. Between 1940 and 1941 the production of

agricultural implements and machinery was nearly trebled. The production of building materials rose to between two and three times the pre-1940 level, while the manufacture of consumers' goods increased by 30 to 40 per cent.

Latvia began to manufacture many articles which had been imported previously. The output of the spinning mills at Riga was greatly increased. Within a short period it was clearly demonstrated that the economy of Latvia was about to enter upon a period of most rapid expansion.

LITHUANIA

Lithuania, part of Poland until its annexation by Russia in 1795, is the most backward—both industrially and agriculturally—of the three Baltic republics, and, like Estonia and Latvia, suffered from the loss of the Russian hinterland after the Great War. Reincorporation with the U.S.S.R. and the restoration of the Vilna region, with the Niemen valley, which is a natural route between Lithuania and the Soviet Union, should do much to assist the expansion of its economy.

The Baltic coastlands produce rye, oats, wheat, potatoes, and sugar-beet. Behind the coastal lowlands are the morainic Baltic Uplands, containing forests, numerous lakes and streams. The inner plains support cattle and dairy farms, while the rivers are used for the transport of timber. Nearly 20 per cent. of Lithuania is forested. Flax, timber, meat, and eggs formed Lithuania's chief exports before 1939. Before the Great War large quantities of timber were floated down the rivers from Byelorussia. The chief industries were small-scale milling, leather-manufacturing, and wood-pulping.

Lithuania contains three towns of moderate size. Kaunas (113,000), the administrative centre before the restoration of the historic capital of Vilna in 1939, is situated at the point where the Konisberg-Vilna railway crosses the river Niemen. It is the main market for cattle and grain. Memel (36,000) is an ice-free port. It possesses saw-mills and celluloid works. Although it is Lithuania's only port, it has no direct communications with the hinterland.

Vilna (201,000) is a junction for railways from Leningrad, Moscow, Warsaw, and Libau. It was an important market (before being annexed by Poland) for Lithuanian timber, cattle, flax, and wool. (For total population, see below.)

As a Soviet Republic Lithuania began the construction of six brick-works, a sugar factory, a number of textile mills, and factories connected with various branches of light industry and the food industry. Plans were made to increase the production of the meat industry by 158 per cent., the sugar industry by 187 per cent., and textiles by 260 per cent.

As in Latvia, large numbers of new schools, hospitals, and clinics were established, and in the State budget provision was made for a vast new programme of social services.

Among the peasantry one of the most popular acts of the Government of the new Soviet Republic was the land reform, which gave new land to large numbers of poor peasants, while on several of the large estates state farms were established. In Lithuania the majority of the population lives on the land; yet before 1939 45 per cent. of the farms were under 25 acres, and these farms shared between them only 16.9 per cent. of the land available for farming. Landlords possessed one-third of all the arable land, 47 per cent. of all the cattle, and 70 per cent. of the agricultural machinery. Large numbers of peasant families possessed neither a cow nor a horse. Many of them had received new land between 1920 and 1922, but lost it again, having to sell it in order to pay the heavy taxes. Soviet Lithuania established about 30,000 new peasant farms, and gave additional land to some 40,000 others. New settlers were given liberal financial assistance, and were absolved of redemption and land taxes.

AREA AND POPULATION OF THE BALTIC REPUBLICS

	<i>Area</i> (<i>Sq. miles</i>)	<i>Population</i> (<i>Aug. 1940</i>)
Lithuania . . .	23,100	2,925,000
Latvia . . .	25,400	1,951,000
Estonia . . .	18,300	1,122,000

(The area ceded by Finland—13,600 square miles—had a population of 450,000, which was mainly evacuated.)

BIBLIOGRAPHY

WESTERN AND CENTRAL REGIONS

Russian

Articles published in "Nasha Strana" (Moscow)

- V. ANUCHIN: "The Kalinin Region," in No. 2, 1939.
 A. VERSHINSKI: "Tver-Kalinin," in No. 4, 1939.
 S. KRUSHINSKI: "The Smolensk District," in No. 3, 1940.
 K. SERGEICHIK: "Smolensk," in No. 3, 1940.
 G. LARIKOV: "Western Byelorussia," in Nos. 10, 11, 1939.
 N. ANOV: "The Vyatka District," in No. 7, 1940.
 V. KHOLODOVSKI: "Ryazan," in Nos. 10, 11, 1939.
 U. ZHUKOV: "Russian Soil" (Voronezh District), in No. 5, 1939.
 L. VASILYEV: "The Kursk Magnetic Anomaly," in No. 9, 1939.
 P. LOPATKIN: Articles on Moscow in Nos. 8, 9, 11, 1940.
 M. RAIKHENBURG: "The Moscow Coal Basin," in No. 7, 1940.
 R. MARKOV: "The Reconstruction of the Upper Volga," in No. 11, 1940.

The Byelorussian S.S.R. (Minsk, 1927).

The Byelorussian S.S.R. (All-Union Agricultural Exposition publication, Moscow, 1939).

- A. IVANOV and A. BORZOV: *The Moscow Region* (Moscow, 1925).
 I. ROMANSKI: *New Moscow* (Moscow, 1938). *The Volga goes to Moscow* (Moscow, 1938).

WESTERN BYELORUSSIA

English

- H. HESSELL TILTMAN: *Peasant Europe* (Jarrolds, 1936). Describes the backward condition of farms and peasantry in Polish-occupied Byelorussia.

Transport, Communications, Foreign Trade, and Distribution of Population in the U.S.S.R.

TRANSPORT AND COMMUNICATIONS

In a modern industrial state the railway system is of paramount importance, an indispensable link between industrial centres and their sources of raw materials, and between the agricultural and urban regions in order to maintain supplies of food.

In 1939 the railways of the U.S.S.R. carried 553,600,000 tons of freight. In 1938 the inland waterways took 66,900,000 tons, and in 1940 about 10 per cent. of all freight was carried by inland waterways. The significance of the railways in the carriage of freight has greatly increased during the last twenty-five years of industrial expansion. The transport system has had to serve an enormous territory, for there is hardly a corner of the Soviet Union which has not been affected to some degree by the rapid economic development of the country. Hence, although since 1917 there has been an increase in mileage of about 50 per cent., the present total length of railway lines—62,500 miles in 1940—is still not at all adequate. In 1937 the load on Soviet railways was much greater than in Great Britain, the U.S.A., or Germany—2.6 million ton-miles per mile of track in the U.S.S.R., as compared with 0.5 and 0.7 ton-miles in Britain and Germany respectively during 1936.

But in spite of the construction of new railways, the eastern lands of the U.S.S.R. still possess a less extensive system than the European part. In 1936, the Ukraine had 52 miles of railway per thousand square miles of territory, Kuibishev and Saratov Regions 24 to 25, Western Siberia 5, Kazakhstan 3, and the Far East only 2. The chief developments have been in connexion with strengthening transport between industrial areas, and between them and sources of raw materials—the double-tracking of the entire Trans-Siberian Railway, the

probable construction of a new alternative route in the Far East, around the northern end of Lake Baikal to Soviet Haven, on the shores of the Pacific, the building of the Amur Railway, the Turk-Sib line, the Urals-Karaganda-Lake Balkhash line, the North Pechora railway from the Pechora coalfield to the Arctic coast, and several new railways in the Ukraine and the Moscow and Leningrad regions. Considerable lengths of main-lines have been electrified, particularly around Moscow, in the Caucasus, the Urals, and between Kandalaksha and Murmansk.¹ Exact details of new construction are not available, since for reasons of military strategy the existence of a number of railways completed recently has not been made known to the public.

Many new motor roads have been built within the last ten years, and these are particularly valuable in areas remote from railways. The most important new trunk roads are as follows: Moscow-Minsk, Amur-Yakutsk, Osh-Khorog (across the Pamir), Tashkent-Stalinabad, and from Biisk in the Altai to the Mongolian People's Republic. Vast areas of the north, however, still possess neither roads nor railways, and depend entirely upon waterways, sledges, and aeroplanes, according to the season.

The inland waterways are of particular value for the transport of heavy and bulky commodities such as oil, timber, grain, ores, etc. The U.S.S.R. is fortunate in possessing a number of large rivers flowing in a longitudinal direction, with tributaries flowing in a latitudinal direction. (See Chapter I.) The Lena has a total length of 2762 miles, the Volga, Yenesei, and Irtysh more than 2000 miles, the Amur and Argun together 2780 miles, while there are nine rivers more than 1200 miles in length, and twenty-five have a length exceeding 600 miles.

The courses of many of these rivers have been regularized, their channels deepened, and their tributaries inter-connected by means of canals. The Baltic-White Sea Canal, Mariinsk Canals, the Moscow Volga Canal, the Don-Volga and Manych Kuma Canals (when completed), and the

¹ The total length of electrified lines in 1940 was 1169 miles.

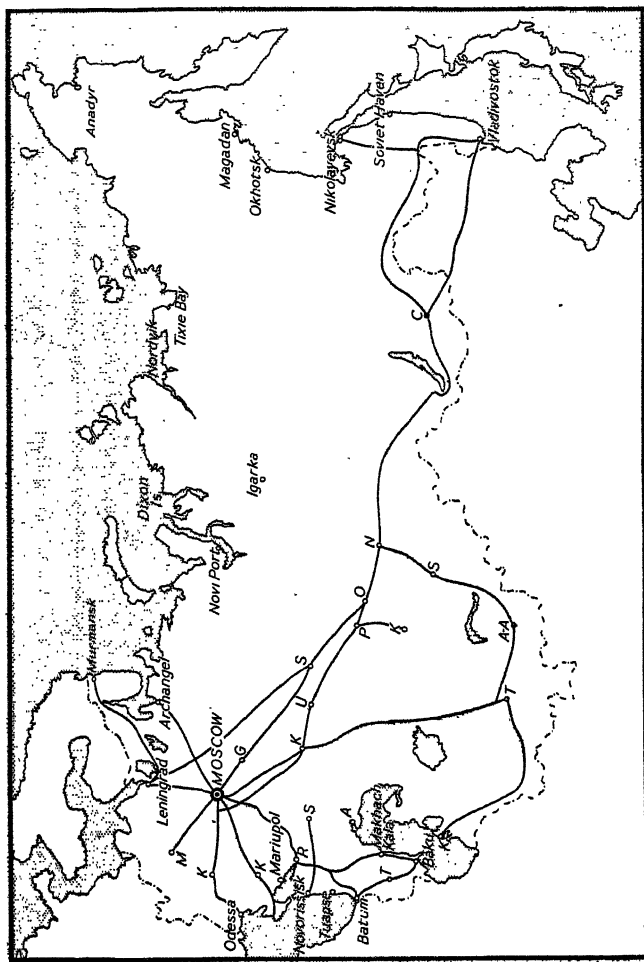


FIG. 67. MAIN RAILWAY ROUTES AND CHIEF PORTS

"Great Volga" Scheme will eventually allow large vessels to take their cargoes from one corner of European Russia to the other—from Astrakhan to Archangel, from Rostov-on-Don to Murmansk. Already there is a through waterway from the White Sea to the Caspian, and Moscow is frequently described by Russian authors as the "Port of Five Seas."

Probably the Ob and the Yenesei will eventually be linked with this great system of inland waterways. The ultimate possibilities were demonstrated in 1935, when a group of young people journeyed in small boats from Irkutsk to Moscow, entirely by water, making only one portage—across the Urals. In this way they followed the route taken by merchants many centuries ago, when tea was carried through Siberia to the great fair at Nizhni-Novgorod (now Gorki). Should ship canals and deepened tributaries enable such a journey to be made by river steamers, the economic development of the north would be greatly accelerated, since already the Yenesei and the Lena are highways of considerable significance.

The total length of the navigable waterways of the Soviet Union was about 52,000 miles in 1935, and had risen to 63,750 miles by 1937. Although frozen over during the winter, they carried in 1940 approximately 10 per cent. of the total freight traffic.

The Volga is of the greatest importance, since with its tributaries it drains about one-third of European Russia—the most densely populated part, in which live some 50 million people. Canals link the Volga with Leningrad, it flows through the metropolitan Moscow Region, while the Kama gives access to the Urals. Thus there is an almost continuous transport artery from the Baltic to the Urals, and from this the Volga flows south to the Caspian Sea, which in turn is a waterway connecting the Caucasus and Central Asia with the Volga and hence with European Russia.

More than 26 per cent. of this traffic is on the Volga, and about one-half of the cargoes carried by this river are concentrated between Stalingrad and the Caspian Sea. The rivers and canals of the northern and north-western regions take

about 35 per cent., while the Kama, not a very long river, but of immense importance as a link between the industries of the Urals and the Volga, takes about 15 per cent. The position of the Siberian rivers is illustrated by the fact that they deal with 7 per cent. of the total freight turnover of the Soviet Union. The greater part of this amount is concentrated in Western Siberia and on the river Amur. The Yenesei carries between 400,000 and 500,000 tons of cargo each year, the Selenga 200,000, and the Lena more than 100,000. (All the figures in this paragraph refer to 1935.)

The Dnieper navigation has been revived following the elimination of the rapids and the deepening of the channel as a result of the construction of the Dnieper power station. About 6 per cent. of the cargoes carried by the Soviet inland waterways passed along the Dnieper in 1935. A similar amount was carried along the river Oka, between Moscow and the Volga. But since the opening of the Moscow-Volga Canal the traffic has greatly increased.

The only other river to carry more than 0.5 per cent. of the total river traffic is, surprisingly enough, the Amu Darya, which took more than 300,000 tons of freight in 1935.

The northern rivers are used largely for the movement of timber. In the Northern Region (European Russia), for example, more than two-thirds of the freight turnover consists of wood. Nine million tons are transported annually, a greater quantity than that of any other single commodity on any other Soviet waterway. The North Dvina is the most important of the timber-carrying rivers of the north. Large amounts are also shipped down the Volga and the Dnieper rivers.

The lower Volga is as valuable for the transport of oil and petroleum products as the northern rivers are for the transport of timber. Two-thirds of the cargoes (by weight) of the ships which ply between the Caspian Sea and Stalingrad consist of crude oil, petroleum, etc.

Mineral ores and building materials make up a considerable proportion of the goods shipped along the Volga, the Dnieper, and the rivers of the north-west. Large quantities of grain

pass along the Kama, Volga, Dnieper, Don, and Kuban, and also along the western Siberian rivers, the Yenessei and the Amur, while about 1,500,000 tons of salt are transported annually along the lower Volga.

INLAND WATERWAY TRANSPORT (1935)

RIVER OR REGION	FREIGHT IN THOUSAND TONS	PERCENTAGE OF TOTAL FREIGHT CARRIED
Volga	17,113	26.4
North-west	11,390	17.6
Northern Region	10,849	16.8
Kama	9,797	15.1
Siberian rivers	4,765	7.4
Dnieper	3,969	6.1
Amu Darya	314	0.5
Moscow-Oka	3,070	4.7
Total (all rivers) ¹	61,267	—

MARINE TRANSPORT

Although the U.S.S.R. is essentially a continental power both coastal and ocean shipping are of considerable importance. For foreign trade the Soviet Union is in the unique position of having ports in the north—Leningrad, Murmansk, and Archangel, giving access to the North Sea and the Atlantic, and Black Sea ports in the south—Odessa, Batum, etc., with access to the Mediterranean, and in the east, Vladivostock, on the Pacific coast, while the Caspian Sea provides a sea route to Iran.

More than 50 per cent. of the freight carried by sea goes through the Black Sea, particularly cargoes of wheat, oil, and coal. Timber comprises the greatest proportion by weight of freight passing through Baltic, northern, and Pacific ports. Within recent years the Soviet merchant fleet has handled an increasing proportion of the import and export trade.

¹ In the table figures are given for freight carried by the more important waterways only. The percentages refer to the proportion of the total freight carried by all rivers.

In 1930 Soviet ships carried nearly 5 per cent. of all exported goods, and 44 per cent. of those imported by the Soviet Union. By 1937 these percentages had increased to 41 and 82 respectively.

Owing to the great distances involved, long-distance maritime transport between one Soviet port and another is not of considerable dimensions. The chief commodities carried on such routes are heavy, bulky materials—cement, from Novorossisk on the Black Sea to Leningrad, and sugar from Odessa to Vladivostok and Archangel being the chief cargoes. Coastal shipping is more important, especially between ports on the Black and Caspian Seas, where 70 per cent. of the freight is composed of oil and petroleum products. The tanker service between Baku and Astrakhan takes a large proportion of the output of the Caucasian oil-wells. At Astrakhan the oil is transferred to river tankers for the journey up the Volga to European Russia. The Black Sea ports are almost ice-free and can therefore be used for a longer period than those of the North. They also lie close to the great grain, coal, metallurgical, and oil regions of the Ukraine, Povolzhye, and the Caucasus.

The chief ports are Odessa (exporting Byelorussian timber and Ukrainian grain, and importing oil from the Caucasus), Kherson, with similar trade to that of Odessa, Nikolayev (exporting Ukrainian wheat, iron from Krivoi Rog, and manganese from Nikopol), Sevastopol, a naval base, Feodosia (exporting Crimean wheat), Mariupol (chief port for the Donetz industrial region, handling coal for Kerch and receiving cargoes of iron, and exporting salt from Artemovsk and grain from the Ukraine), Rostov (exporting wheat), Tuapse (exporting oil, wheat, and valuable Caucasian timber), Novorossisk (exporting wheat from the pre-Caucasus, wheat and timber from the Volga lands, and cement), Poti (exporting manganese from Chiatury), and Batum (exporting Baku oil).

The Caspian Sea is important for shipping between the Caucasus, the lower Volga, Kazakhstan, and Central Asia, as well as with Iran. Baku exports oil to Astrakhan and

imports wheat and timber from the Volga. Krasnovodsk exports cotton from Central Asia and imports timber and grain. From Makhach-Kala oil is sent to Astrakhan and grain to Krasnovodsk. Astrakhan occupies a central position between the other ports, being an entrepôt port between them and the Volga basin.

The great Baltic port of Leningrad, exporting timber, wheat, and apatite (mineral fertilizer from the Khibin highlands), is ice-bound for two to three months of the year, when its place is taken by the ice-free port of Murmansk. Archangel, the chief port for the Soviet timber export, is closed by ice for 190 days of the year. The smaller ports of Kandalaksha and Belomorsk on the White Sea have become more important since the construction of the Baltic-White Sea Canal and the development of the mineral resources of the Khibin Mountains.

The Pacific ports have a much less developed hinterland than those of the north and south, and are far away from the main centres of population and industry. Vladivostock, an important naval base and eastern terminus of the northern sea route, exports timber and supplies the peoples of the Far North with their various requirements. Petropavlovsk, the chief port of Kamchatkha, exports timber also. Magadan, situated on Nogayev Bay in the Okhotsk Sea, is the new port for the recently developed gold industry of the upper Kolyma valley, with which it is connected by a motor road.

In 1937 the most important Soviet ports (in terms of freight tonnage passing through them) were Baku, Astrakhan, Makhach-Kala, Odessa, Batum, and Leningrad.

The Soviet merchant fleet had to be almost entirely reconstructed after 1921. The tonnage of the pre-revolutionary merchant navy was only $1\frac{1}{2}$ per cent. of the world-total, and only 40 per cent. of this remained after the Revolution and the wars of intervention. By 1937, however, the fleet had increased to one and a half times (by tonnage) that of 1913, and well-equipped shipbuilding and repairing yards had been established or reconstructed at Archangel, Leningrad, Nikolayev, Sevastopol, Baku, Astrakhan, Vladivostock, and

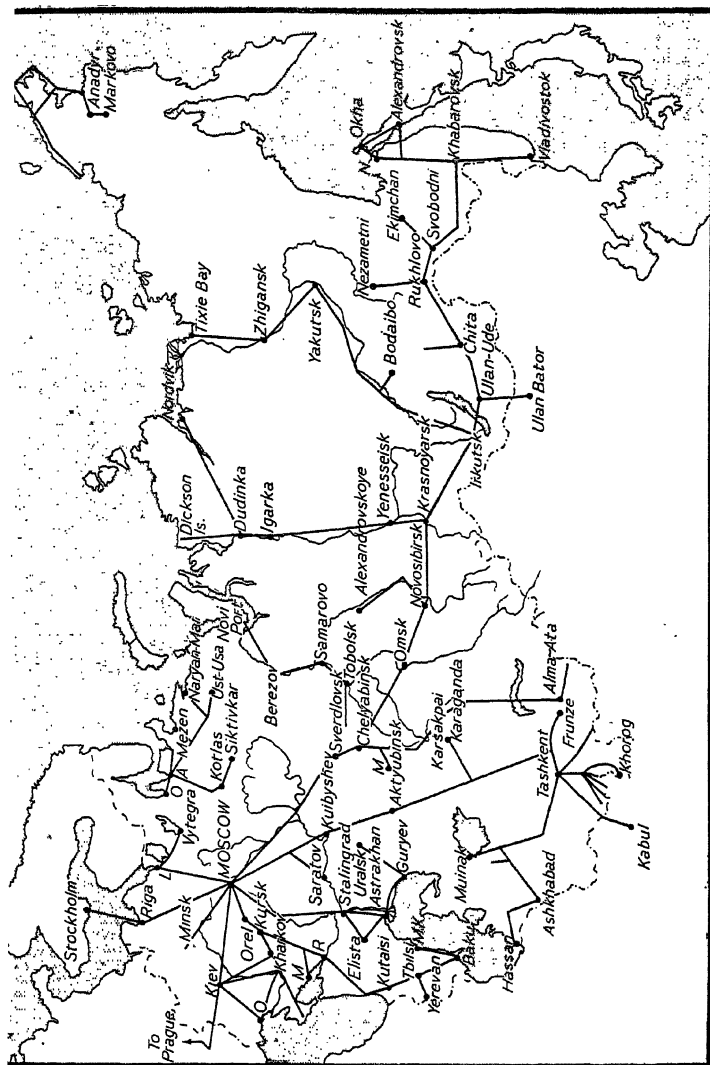


FIG. 68. CHIEF AIR ROUTES

Komsomolsk-on-Amur. The chief ports are fully equipped with mechanized loading and transport devices. This applies both to seaports and the chief ports on the inland waterways. Several new ports have been created—Ilych on the Caspian Sea, and Igarka, Tixie, and others on the northern sea route.

The latest form of transport to be developed in the Soviet Union, as elsewhere, is air transport. In 1937 the air services of the U.S.S.R. linked practically every part of the country with Moscow (Fig. 68). They are of especial value in maintaining contact with the more remote parts of the Union, particularly the more distant parts of Siberia and the Arctic coast. Soviet air lines carried 9400 tons of mail and 38,000 tons of freight in 1937. The total length of the air lines was 66,000 miles. In 1939, 11,517 tons of mail and 39,654 tons of freight were carried, while by 1940 the length of air lines in regular use had risen to 88,125 miles.

TRANSPORT IN THE U.S.S.R.¹

	1913	1938-40
Railways		
Lines in operation (thousand miles) . . .	36.6	62.5 ⁽¹⁹⁴⁰⁾
Electrified lines (thousand miles) . . .	—	1.169 ⁽¹⁹⁴⁰⁾
Total freight carried (million tons) . . .	132.4	553.6 ⁽¹⁹⁴⁰⁾
Passengers carried (millions) . . .	184.8	1,177.8 ⁽¹⁹³⁸⁾
Inland Waterways		
Total length used for transport (thousand miles) . . .	27.9	65.8 ⁽¹⁹³⁹⁾
Total freight carried (million tons) . . .	18.4	66.6 ⁽¹⁹³⁸⁾
Passengers carried (millions) . . .	17.8	68.1 ⁽¹⁹³⁸⁾
Ocean Transport (in million tons)		
Freight carried by all ships . . .	33.1	40.6 ⁽¹⁹³⁵⁾
Freight carried by Soviet merchant fleet .	—	30.4 ⁽¹⁹³⁸⁾
Road Transport		
Motor lorries and buses in operation . . .	—	806,100 ⁽¹⁹³⁹⁾
Main trunk roads (thousand miles) . . .	15	54.7 ⁽¹⁹³⁷⁾
Air Transport		
Total length of air lines in operation (miles) . . .	—	88,125 ⁽¹⁹⁴⁰⁾
Weight of mail carried (tons) . . .	—	11,517 ⁽¹⁹³⁹⁾
Total freight carried (tons) . . .	—	39,654 ⁽¹⁹³⁹⁾
Passengers carried . . .	—	307,000 ⁽¹⁹³⁹⁾

¹ See "Soviet Transport To-day and To-morrow," by W. Mandel, in *American Review of the Soviet Union*, vol. iii (February 1941).

AIR SERVICES OF THE NORTHERN SEA ROUTE (1938)

Length of air lines . . .	7,687.5 miles
Total freight carried . . .	338.2 tons
Total mail carried . . .	203.7 tons
Passengers carried . . .	12,270

RAILWAY TRANSPORT IN SOVIET REPUBLICS¹ (1913 AND 1936)

REPUBLIC	FREIGHT CARRIED, IN THOUSAND TONS		NEW RAILWAY: CONSTRUCTED, IN MILES
	1913	1936	
Ukraine . . .	102,156	293,919	1,261.2
Byelorussia . . .	4,369	18,365	601.8
Armenia . . .	460	2,307	16.2
Turkmenistan . . .	1,034	5,347	121.2
Uzbekistan . . .	2,712	10,659	366.2
Tadjikistan . . .	173	1,386	87.5
Kazakhstan . . .	1,102	18,356	2,257.5
Kirghizia . . .	—	2,365	96.9

Total length of railways constructed, 1913-36: 21,562.5 miles.

PRODUCTS CARRIED BY INLAND WATER TRANSPORT IN THE U.S.S.R. (1935), IN THOUSAND TONS

(Figures in bold type indicate the largest tonnage of each commodity on a single river.)

WATERWAY	TOTAL FREIGHT CARRIED	PETROLEUM PRODUCTS	TIMBER		GRAIN	MINERAL AND BUILDING MATERIALS	SALT
			On Ships	On Rafts			
Upper Volga . . .	5,492	96	1,246	2,906	201	550	15
Middle Volga . . .	2,554	34	445	445	612	671	3
Lower Volga . . .	9,066	6,236	88	333	298	133	1,326
Moscow-Oku . . .	3,070	3	752	486	47	1,237	4
Kama . . .	9,797	26	385	7,493	899	179	27
Ural . . .	175	1	29	7	42	2	15
Rivers and canals of North-west Euro- pean Russia . . .	11,390	72	3,095	5,219	94	2,386	1
Rivers and canals of North European Russia . . .	10,849	10	1,244	9,001	156	149	17
Pechora . . .	317	5	18	173	36	5	1
Dnieper-Dvina . . .	1,036	0.6	538	185	51	85	4
Dnieper . . .	3,969	108	499	918	534	822	4
Don-Kuban . . .	1,443	63	177	55	364	268	71
Kura . . .	203	41	9	—	16	54	21
Amu-Darya . . .	314	33	28	19	97	2	1
Lake Issyk-Kul . . .	50	2	3	—	35	—	0.4
Aral Sea . . .	79	4	2	—	60	0.5	0.5
Balkhash-Il' . . .	138	3	8	21	11	20	1
Western Siberia . . .	1,149	35	547	47	308	18	22
Lower Irtysh . . .	1,047	60	402	161	279	4	30
Upper Irtysh . . .	266	10	8	—	46	23	2
Venetski . . .	435	11	88	117	134	1	4
Eastern Siberia . . .	247	2	20	43	41	67	1
Selenga . . .	200	7	7	91	45	14	1
Amur . . .	1,305	191	11	645	186	65	13
Lena . . .	116	4	2	36	28	2	2

¹ See *Twenty Years of Soviet Power* (Moscow, 1935).

FREIGHT HANDLED BY THE CHIEF SEA-PORTS OF THE U.S.S.R.,
IN THOUSAND TONS (1935)

	TOTAL	LOCAL COASTING TRADE
Baku	10,445	10,179
Astrakhan	6,609	6,598
Makhach Kala	5,759	5,757
Batum	5,062	2,162
Leningrad	4,320	6
Odessa	3,771	2,803
Mariupol	2,479	1,169
Novorossisk	2,302	1,147
Archangel	2,282	436
Vladivostok	2,021	864
Krasnovodsk	1,658	1,658
Nikolayev	1,554	360
Tuapse	1,507	971
Murmansk	1,362	740
Poti	1,240	633
Feodosia	735	231
Kherson	685	435
Kerch	620	602

FREIGHT TONNAGE HANDLED BY SOVIET PORTS (1935)
(PERCENTAGE OF TOTAL) BY NATIONALITY OF VESSELS

	EXPORTS	IMPORTS
U.S.S.R.	24.2	67.4
Great Britain	14.0	3.6
Japan	1.3	14.8
Greece	15.7	1.6
Norway	8.8	3.1
Germany	8.7	0.1
Italy	7.2	0.2
Denmark	4.5	1.1
Sweden	3.5	—
France	1.7	0.6

THE POPULATION OF THE U.S.S.R.

(Figs. 69 and 70)

The population of the U.S.S.R., according to the census of 1939, was 170,467,186. Since 1939 the population has increased by the addition of new territory, as shown below. These approximate figures for the new territories refer to the average for 1939-41.

POPULATION (1939)

U.S.S.R.	170,500,000
Estonian S.S.R.	1,220,000
Latvian S.S.R.	1,950,000
Lithuanian S.S.R.	2,925,000
Bessarabia and N. Bukhovina	3,700,000
Finno-Karelia	200,000
W. Ukraine and W. Byelorussia	12,500,000
Total.	192,995,000

In 1939 there were fourteen major national groups with populations of 100,000 or more, and 175 smaller groups with a total population of 17,200,000. About 64 per cent. of the population of the U.S.S.R. is in the R.S.F.S.R., about 21 per cent. in the Ukraine and Byelorussia, 5 per cent. in Transcaucasia, and 10 per cent. in Soviet Asia (see Chapter VI).

POPULATION OF MAJOR NATIONAL GROUPS (1939)

NATIONALITY	POPULATION, IN MILLIONS	PERCENTAGE OF TOTAL
Russian	99.0	58.05
Ukrainian	28.1	16.48
Byelorussian	5.3	3.11
Uzbek	4.8	2.82
Kazakh	3.1	1.82
Jewish	3.0	1.76
Azerbaijan	2.3	1.35
Georgian	2.2	1.29
Armenian	2.2	1.29
Tadjik	1.2	0.70
Kirghiz	0.9	0.53
Turkmen	0.8	0.47
Karelian	0.3	0.18
Finnish	0.1	0.06
Others	17.2	10.09

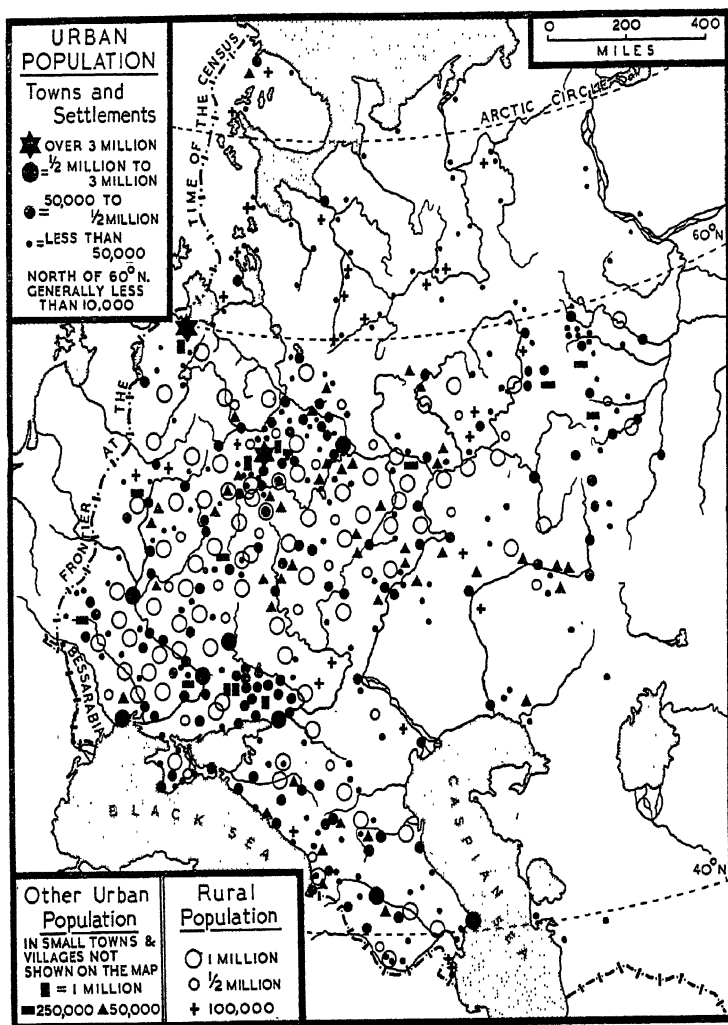


FIG. 69. THE DISTRIBUTION OF POPULATION IN EUROPEAN RUSSIA

The greatest concentration is to be found in European Russia. Beyond the Urals and the Volga the population becomes less dense, and is largely confined to a wide zone on either side of the Trans-Siberian Railway, between the arid lands of the south and the cold lands of the north, and mainly in the steppe lands. From this broad populated belt, extending from west to east across Siberia, another populated belt extends southward from the district around Novosibirsk, into the irrigated lands of Soviet Central Asia.

The increase in the total population of the Soviet Union since the Census of 1926 was nearly 24,500,000, representing an average annual growth (1926-39) of 1.3 per cent. per annum—a rate of increase greater than that of the U.S.A., Germany, or Great Britain during the same years. This rapid expansion was due not only to the great increase in the birth rate, especially in the towns, but also to the marked lowering of the mortality rate.

An analysis of the distribution of the population in 1939, as compared with that of 1926, shows that the greatest increase is to be observed in the new industrial areas (in some cases with absolutely new towns) established or rapidly developed since 1927, in many of the older centres of industry, and in the Soviet Republics of the non-Russian nationalities. The expansion of agriculture and industry in areas outside European Russia has resulted in a more even distribution of the population, while the progress in industrial development throughout the U.S.S.R. as a whole has been responsible for a sharp increase in the urban population.

The urban population of the U.S.S.R. in 1926 amounted to 17.9 per cent. of the total. By 1939 it had increased to 32.8 per cent. In addition to the natural increase of the urban population (5,300,000), about 18,500,000 people moved from the villages to towns and cities, and 9,800,000 inhabitants of villages entered occupations of an industrial character. The urban population more than doubled in twelve years, and during the same period the output of industry increased 6.7 times.

At the same time, however, while the urban population

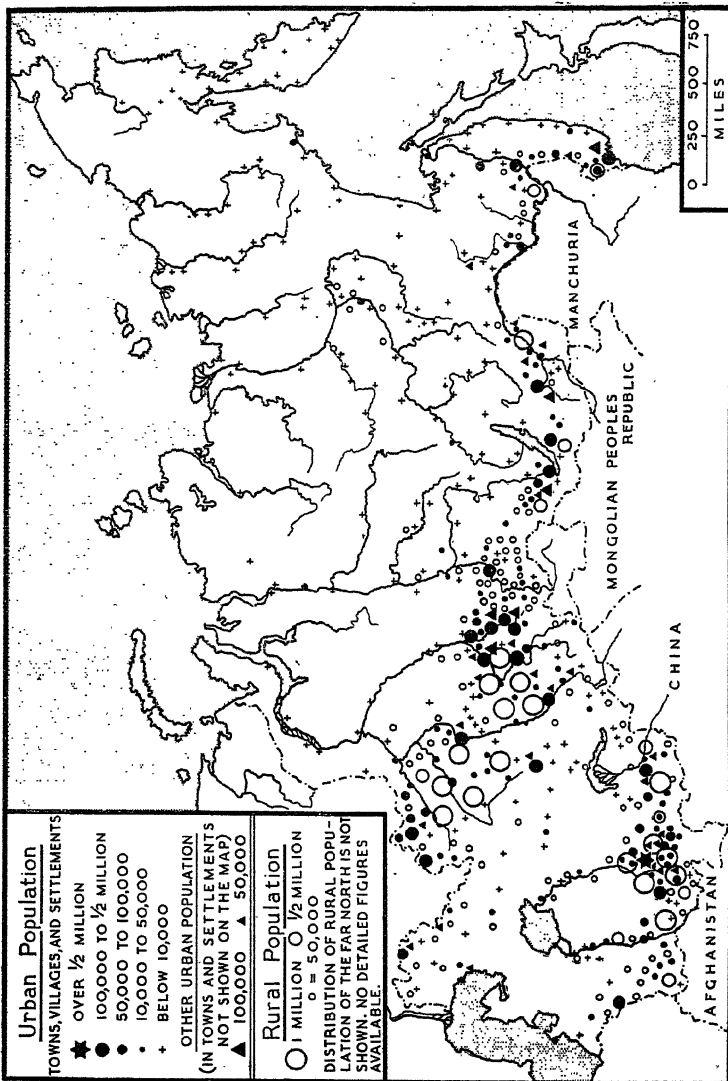
Urban Population
TOWNS, VILLAGES, AND SETTLEMENTS

★ OVER 1/2 MILLION
● 100,000 TO 1/2 MILLION
● 50,000 TO 100,000
• 10,000 TO 50,000
+ BELOW 10,000

OTHER URBAN POPULATION
(IN TOWNS AND SETTLEMENTS NOT SHOWN ON THE MAP)
▲ 100,000 ▲ 50,000

Rural Population
○ 1 MILLION ○ 1/2 MILLION
○ = 50,000

DISTRIBUTION OF RURAL POPULATION OF THE FAR NORTH IS NOT SHOWN. NO DETAILED FIGURES AVAILABLE.



more than doubled, the rural population fell to 94.9 per cent. of that in 1926. Nevertheless agricultural production increased rapidly. Nearly four times as much marketable grain was produced in 1939 as in 1926.

The distribution of the larger towns of the Soviet Union, and the population of the Soviet Republics, shown in the tables at p. 585, illustrates clearly the growth of industrial centres outside European Russia, and the growth of the population of the non-Russian national groups.

It is noteworthy that, although in every republic the greatest increase has been in the urban population, the rural population still exceeds it. Nevertheless, the most striking fact revealed by the 1939 census was undoubtedly the growth of the number of inhabitants of towns. Karaganda, Magnitogorsk, Komsomolsk, and Stalinogorsk are entirely new towns which did not exist before 1926. Together with Kounrad, Igarka, and six industrial centres of the Kuznetsk basin which were formerly villages, they are examples (with the exception of Stalinogorsk) of industrial centres created in areas where there was practically no industry before the beginning of the first Five Year Plan. The industrialization of the Urals, Siberia, and the Far East has resulted in a total increase in the population of these regions of nearly 6,000,000, or 33 per cent. since 1926, including 3,000,000 people who came into these regions from other parts of the Soviet Union.

The increase in each of these regions was as follows:

PERCENTAGE INCREASE OF POPULATION (1926-39)

Western Siberia and the Urals

Sverdlovsk region	53
Novosibirsk region	53

Central and Eastern Siberia

Irkutsk region	49
Chita region	73
Buryat Mongolia	39

Far East

Khabarovsk region	136
Maritime territories	42

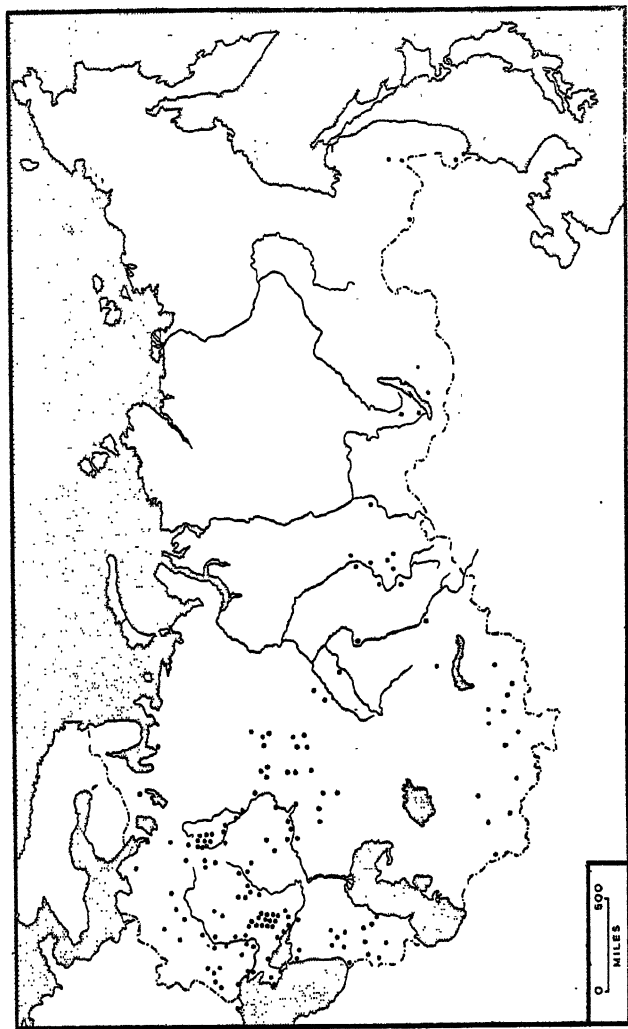


FIG. 71. THE DISTRIBUTION OF TOWNS OF MORE THAN 50,000 INHABITANTS
(Figures from the 1939 census)

There was a corresponding increase in the older industrial centres: Stalino (Ukraine), 91 per cent.; Moscow region, 74 per cent.; Leningrad region, 44 per cent.; Archangel region, 25 per cent.; Murmansk region, nine times. On the other hand, a number of the older populated centres showed a decrease of 80 to 90 per cent.—*e.g.*, the Kalinin, Kursk, Ryazan, Penza, Smolensk, Poltava, and Vinnitsa regions. The decrease in each case was due to a movement of population eastward, to newly established industrial centres, especially to the Urals and the Kuznetsk basin. This movement was most marked in the Ukrainian and Byelorussian Republics, where the increase in population was below the average of 15.9 per cent. for the U.S.S.R. (7 per cent. and 12 per cent. respectively). This migration of large numbers of people is reflected in the increase of the population of the Autonomous Republics and Autonomous Provinces of the R.S.F.S.R. by 23 per cent. and 58 per cent. respectively.

Finally, the expansion of the economy of the larger non-Russian nationalities resulted in a considerable increase in their populations. The population of the Kirghiz, Tadjik, Uzbek, and Turkmen Republics increased by 2,880,000, or 38 per cent. This includes 1,700,000 people who came into these republics from other parts of the U.S.S.R. In Kazakhstan, on the other hand, there was an increase of only 1 per cent., largely owing to the fact that many former nomadic people moved into the adjacent regions, particularly the Uzbek and Kirghiz Republics.

Other notable increases in the population of the non-Russian nation groups are to be observed in Armenia (45.4 per cent.) and in Georgia (32.3 per cent.).

Thus the present distribution of population reveals clearly that the Soviet Union is no longer almost entirely an agricultural nation—49.7 per cent. of the population was classified in the 1939 census as “workers by hand and brain” in contrast to farm-workers—and that there is a definite tendency towards a more even distribution of population throughout the U.S.S.R. as a whole. This is reflected in the increased population of Siberia and the Asiatic republics. Everywhere there

DISTRIBUTION OF THE LARGER TOWNS OF THE U.S.S.R.

	NUMBER OF TOWNS IN EACH AREA (GROUPED ACCORDING TO POPULATION)			
	Over 500,000	100,000 to 500,000	50,000 to 100,000	Total over 50,000
EUROPEAN RUSSIA AND THE				
URALS	10	53	72	134
North	1	2	4	7
Central	2	17	27	46
South	7	20	30	57
Ukraine and Crimea	4	14	18	36
Pre-Caucasus	1	5	8	14
Caucasian Republics	2	1	4	7
East	0	14	11	25
Volga lands	0	6	4	10
The Urals	0	8	7	15
ASIATIC RUSSIA (Kazakhstan and the Central Asiatic Republics)	1	6	12	19
SIBERIA AND THE FAR EAST	0	12	8	20
Western Siberia	0	6	4	10
Central Siberia	0	2	1	3
Eastern Siberia	0	2	0	2
The Far East	0	2	3	5

POPULATION OF THE SOVIET REPUBLICS

REPUBLIC	POPULATION (1939)			1939 AS A PERCENT- AGE OF 1926		
	TOTAL	URBAN millions	RURAL millions	Urban	Rural	Total
R.S.F.S.R.	109,278,614	36.7	72.6	218.4	94.7	116.9
Ukraine	30,960,221	11.2	19.8	208.3	83.5	106.6
Byelorussia	5,567,976	1.4	4.2	161.9	101.5	111.7
Azerbaijan	3,209,727	1.2	2.0	178.7	123.1	138.7
Georgia	3,542,289	1.0	2.5	179.5	118.9	132.3
Armenia	1,281,599	0.4	0.9	219.3	128.1	145.4
Turkmenistan	1,253,985	0.4	0.8	304.0	97.3	125.6
Uzbekistan	6,282,446	1.4	4.8	142.8	136.1	137.6
Tadjikistan	1,485,091	0.3	1.2	237.6	133.1	143.9
Kazakhstan	6,145,937	1.7	4.4	328.7	79.9	101.2
Kirghizia	1,459,301	0.3	1.2	221.2	135.2	145.7
Total	170,467,186	55.9	114.5	221.5	94.9	115.9

is a definite migration from the countryside to the town—a migration which, however, is not accompanied by any lowering of agricultural productivity, since it is compensated by a more rational employment of labour and a greater use of machinery.

FOREIGN TRADE

During the past twenty-five years the U.S.S.R. has been mainly concerned with the reconstruction and development of its agriculture and industry. In the early years of this reconstruction there were large imports of machinery, and considerable exports of petroleum, timber, wheat, and other agricultural produce. When heavy industry had been established, however, there was no longer the necessity to import so much machinery, and the Soviet Union was able to produce practically all the manufactured goods which her people required, in addition to providing a small surplus for export. The increase in the population and the standard of living resulted in a larger internal consumption of grain and agricultural produce, so that there was less available to sell abroad (1,600,000 tons of grain in 1935, as compared with the average of 10,000,000 tons before 1914).

Of the 10,809,500 tons of freight included in foreign trade which passed through Soviet ports in 1938, a greater proportion went out of the country than came in. Exports amounted to 9·7 million tons, valued at 1·3 million roubles, and imports 1·1 million tons, valued at 1·4 million roubles. Both exports and imports were far below the level of 1913, when Russia exported raw materials and agricultural products and imported manufactured goods. Whereas in 1913 nearly 30 per cent. of Russian exports were industrial timber and mineral products and 70 per cent. agricultural, by 1937 these percentages were practically reversed. The rapid industrialization of the U.S.S.R. is reflected in an absolute increase of exports of petroleum products, machinery, chemicals, and other manufactured goods, and a decrease in grain and agricultural produce.

The U.S.S.R. occupies an important place in the world's timber trade. Exports are sent through twenty-eight ports—

pit props from Murmansk, timber of all types from Archangel and Leningrad, boxboard from Novorossisk, pulpwood from Odessa. As compared with 1913, the timber export has greatly increased, the tendency being to export a greater proportion of semi-manufactured timber such as boards, plywood, etc.

In 1937 Soviet exports were made up as follows: Petroleum products, 35 per cent.; metals, machinery, and industrial products, 23 per cent.; chemicals, 10·3 per cent.; and coal, 7·8 per cent. The industrial nature of the exports is matched by the decrease in imported industrial goods since 1913. In 1913 nearly 44 per cent. of all machinery used in Russia was imported, in 1937 only 0·009 per cent. In 1913 nearly 20 per cent. of Russia's coal was imported, in 1937 none. Until the threat of war compelled the Soviet Union, in 1938, to buy stocks of cotton and rubber practically all the requirements of the country were satisfied by home production, in the case of cotton, and about 24 per cent. in the case of rubber. Yet in 1913 all the rubber used in Russia, and nearly 47 per cent. of the cotton, was imported. In 1938 coal, pig-iron, agricultural machinery, motor lorries, fertilizers, cotton and canned goods, all of which were imported in 1913, were being exported.

From 1928 to 1938 England and Germany, followed by Holland, France, Italy, Belgium, and Iran, were the chief purchasers of Soviet exports. By 1938, however, the U.S.A. had risen to fourth place, with Great Britain, Turkey, and Belgium occupying the first, second, and third places respectively. Holland and Germany were also important purchasers. A considerable amount of exports went to Mongolia and Spain. Goods exported to Britain consisted largely of lumber products, petroleum, furs, linen flax, wheat, butter, and poultry, and to Germany and the U.S.A. similar commodities, with the addition of manganese ore and asbestos. The sale of canned fish to the U.S.A. was steadily increasing up to 1939. Mongolia, Iran, Western China, and Afghanistan purchased sugar, cloth, clothing, dry goods, leather, metal products, etc., while the Soviet Government erected textile

factories in Turkey and Mongolia. The exports to the eastern countries, as yet with little industry of their own, is particularly significant, and suggests future possibilities for Soviet trade after the present war.

The U.S.S.R. imported mainly from the United States, Great Britain, Holland, China, and Germany. From the U.S.A. came iron, steel, non-ferrous metals, machinery, and tools, and from Great Britain industrial equipment, non-ferrous metals, wool, rubber, jute, tea, and ships. About one-fifth of all goods re-exported from Britain were sold to the U.S.S.R., re-exported merchandise accounting for a large proportion of British exports to the Soviet Union. Germany sold machinery and tools, while Iran, Afghanistan, Mongolia, and Western China exported cotton, hides, tea, wool, and livestock.

Thus, taking the foreign trade of the U.S.S.R. as a whole, we see that Great Britain, Germany, and the U.S.A. played a dominant rôle, and there was an increasing volume of trade with the eastern nations mentioned above. Although the absolute volume of the latter was small in 1938, the potentiality is great, especially in view of the increasing industrial and agricultural productivity of Soviet Central Asia and Eastern Siberia. Should it be possible to establish a larger number of colonists in the Far East there would be a greater expansion of both agriculture and industry, well placed to meet the needs of China and Manchuria, while the geographical position of the Ukraine, the Caucasus, and the Asiatic republics in relation to North Africa, the Middle East, and India respectively, is most significant.

In the Far East Japan is the main competitor, enjoying the advantage of a denser population in addition to the economic advantages gained by her aggression in Manchuria and China.

The Soviet Far East possesses a great variety of timber and mineral resources, has excellent agricultural land, and is served by a first-class Pacific port—Vladivostock—in addition to possessing a land frontier with Mongolia, Manchuria, and China. Timber has for many years been exported to Japan and China. Sakhalin oil is now refined at Khabarovsk, and is

able to compete with Japanese oil from the same island (see note at p. 592). The fisheries and fish- and crab-canneries supply a large and increasing surplus for export each year, and salt for the industry is now imported from mines near the Arctic shores. In 1934 zinc was being exported by sea from Tetiakha, north of Vladivostock, and in the future it will probably be possible to export coal from the Suchan, Bureia, and Sakhalin mines, and iron, steel, and non-ferrous metal products from the new industrial centres.

Although political tension on the Manchurian frontier and the Japanese development of the port of Darien have hindered the progress of Vladivostock's trade, this port continues to export timber, fish, and canned goods in considerable quantities, and to import tea.

Trade with China is carried on now largely by road, across Sinkiang. But in normal times the Pacific coast trade was important. Russia was the first European nation to establish direct trading relations with China, and is the most important importer of China tea, although the growth of Soviet plantations in Georgia has already done much to reduce these imports.

The U.S.S.R. also imports foodstuffs and raw materials, and exports oil (mainly kerosene), textiles, agricultural machinery, tobacco, and timber.

India also exports some tea to the Soviet Union (although before 1940 this trade was gradually decreasing) together with jute and jute products. Petroleum, particularly kerosene, is sold to India, as well as soda and soda products. Much of the trade with India is, however, carried on through Britain. Tea and jute, for example, are re-exported from England. The Soviet Union supplies Afghanistan, Iran, and Iraq with sugar, textiles, and glass, while Palestine imports oil and wood for the making of packing-cases for oranges. Egypt enjoys a very favourable geographical position in relation to the U.S.S.R., and normally imported timber, petroleum, coal, and textiles. But the actual volume of trade between the two countries was very small. Tropical products (*e.g.*, tin and rubber from the Dutch East Indies) were shipped to the

U.S.S.R. mainly through European countries. There is certainly the possibility of developing direct trade between tropical countries and the Pacific or European ports of the Soviet Union.

Up to the present the greatest volume of Soviet eastern trade has been overland—to Mongolia and China especially—rather than by sea. There is a great and expanding market for Soviet industrial and food products in these countries and in Afghanistan, Iran, and Iraq.

Oil, timber, and coal should find markets in these countries, and also in Egypt and India. The Far Eastern refineries are well placed to supply China with petroleum, while the Caucasus is in a central position for the Near and Middle East.

In 1935 about two-thirds of the imported freight, and a quarter of the export tonnage, was carried by Soviet ships, British, Greek, and Japanese ships carrying a large proportion of the remainder. With the growth of the Soviet merchant fleet, however, there has been a steady increase in the proportion of foreign trade handled by Soviet vessels (see p. 570). The chief ports engaged in foreign trade are Leningrad, Murmansk, Archangel, Batum, Odessa, Novorossisk, and Vladivostock.

IMPORTS AND EXPORTS (1938)

CHIEF COUNTRIES TRADING WITH U.S.S.R.	PERCENT- AGE OF TOTAL EXPORTS ¹	PERCENT- AGE OF TOTAL IMPORTS ¹	VALUE (MILLION ROUBLES) OF TOTAL EXPORTS	VALUE (MILLION ROUBLES) OF TOTAL IMPORTS
Great Britain . . .	28.2	6.9	375	240
Germany . . .	6.6	4.7	88	67
Belgium . . .	8.8	4.5	117	64
France . . .	4.5	2.7	60	39
Holland . . .	7.0	7.2	93	103
Iran (1935) . . .	4.3	8.6	58 ²	64 ²
U.S.A. . .	7.3	28.5	97	406
Japan . . .	0.6	1.3	6	18
Western China . . .	1.6	—	44	68
Italy . . .	0.9	—	—	0.1
Turkey . . .	—	—	23	23

¹ By value.

² 1938.

FOREIGN TRADE

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PRINCIPAL EXPORTS AND IMPORTS (1938) IN
MILLIONS OF ROUBLES

EXPORTS

Grain	175
Legumes	18
Oil cake	30
Sugar	34
Tobacco	18.5
Butter	0.6
Wood and timber products	280
Flax	27
Cotton textiles	52
Furs	130
Hides and leather	8
Petroleum	102
Chemical products and fertilizers	25
Iron and steel products	21
Machinery and equipment	32
Coal	20 ¹
Manganese ore	27

IMPORTS

Machine-tools	236
Non-ferrous metals	238
Iron and steel products	115
Cotton	27
Wool	72
Rubber	52
Electrical machinery and apparatus	57
Ships and boats	25
Precision tools	22
Internal combustion engines	10
Cars and lorries	11.8
Paper	5
Livestock	47
Tea	27
Herrings	22
Cocoa	10.5
Rice	12
Citrus fruits	15
Dried fruits	8
Coffee	1
Jute	7

¹ Estimated.

CLASSIFICATION OF EXPORTS AND IMPORTS (1913 AND 1937)
IN PERCENTAGES OF THE WHOLE

EXPORTS

	1913	1937
Raw products of agriculture .	56.1	27.0
Products of heavy industry .	8.1	24.6
Products of light industry .	7.6	13.4
Products of timber industry .	10.8	25.3
Food products	16.9	8.9
Miscellaneous	0.5	0.6

IMPORTS

	1913	1937
Materials used in industry .	70.6	90.9
Consumers' goods	29.4	9.1

NOTE ON THE JAPANESE CONCESSIONS IN NORTHERN
SAKHALIN AND ON THE FISHERIES CONVENTION

In 1925 the Soviet Government granted to Japan oil and coal concessions in Northern Sakhalin for a period of forty-five years. However, as a result of protocols and agreements signed in Moscow, in March 1944, the concessions are being liquidated twenty-six years before the date of expiration agreed upon in 1925, while a new Soviet-Japanese Agreement on the Fisheries Convention provides for (1) the withdrawal of certain fishing lots in Far Eastern waters leased to Japanese fisheries owners; (2) the right of Soviet organizations annually to purchase by auction 10 per cent. of the Japanese fishing lots coming up for sale; and (3) the raising of payments in gold made by the Japanese fisheries owners.

In modifying the Fisheries Convention of 1928, according to which the activities of Soviet fishing organizations and Soviet citizens were subject to a number of substantial reductions, the Soviet-Japanese Agreement of March 1944 provides for the cancellation of all these restrictions.

Until the end of the present war, Japanese subjects and other foreigners are prohibited from fishing in certain sea territories in the Far East, as laid down by the Soviet Government in July 1941.

In addition, the Japanese Government has undertaken the guarantee that all fishing lots leased to Japanese subjects

which are situated on the eastern coast of Kamchatkha and in the Olyutorsk District shall not be exploited by Japanese lease-holders until the end of the war in the Pacific.

BIBLIOGRAPHY

CANALS AND WATERWAYS

Russian

Articles published in "Nasha Strana" (Moscow)

- D. ABRAMOVICH: "The Rivers of the U.S.S.R.," in No. 1, 1939.
 R. MARKOV: "The Reconstruction of the Upper Volga," in No. 11, 1940.
 M. RAIKENBURG: "Volga-Don," in Nos. 10, 11, 1939. "The Volga Baltic Waterway," in No. 1, 1941.
The Volga goes to Moscow (in Russian), (Moscow, 1938).

POPULATION

Government Census of 1939 and the official notes issued with it.
 (There is a translation in the library of the Society for Cultural Relations with the U.S.S.R.)

Russian

Article published in "Nasha Strana" (Moscow)

- Census figures and article, in No. 7, 1939.
 "Political and Administrative Divisions of the U.S.S.R.," September 1939. Bulletin of the Supreme Soviet of the R.S.F.S.R. *Administrative and Territorial Divisions of the Union Republic* (Moscow, 1937).

English

- B. SEMENOVA-TIANSHANSKY: article on the 1926 Census in *Geographical Review*, vol. xviii, 1928.
 "The Geographical Background of Russian Life," in *Geography* (June 1931).

FOREIGN TRADE

- S. P. TURIN: *The U.S.S.R.: An Economic and Social Survey* (Methuen, 1944).
 L. VOLIN: "Grain Exports of the Soviet Union," in *Foreign Agriculture*, No. 5, 1941 (U.S. Dept. of Agriculture, Washington, D.C.).
Foreign Trade of the U.S.S.R. for Twenty Years, 1918-37 (Moscow Sci. Inst. of Foreign Trade Monopoly, 1939).
Trade Relations of the U.S.S.R. with Capitalist Countries (Moscow Sci. Inst. of Foreign Trade Monopoly, 1939).

APPENDIX

POLITICAL AND ADMINISTRATIVE DIVISIONS OF THE U.S.S.R. AS ON SEPTEMBER 1, 1939¹

SOVIET REPUBLICS, TERRITORIES, REGIONS, AND AUTONOMOUS REPUBLICS	CAPITALS OF REPUBLICS AND ADMINISTRATIVE CENTRES OF TERRITORIES AND REGIONS	Dis- TRICTS	TOWNS	NUMBER OF WORKERS, SETTLEMENTS AND SETTLEMENTS OF TOWN TYPE	VILLAGE SOVIETS
U.S.S.R.	Moscow	3,564	934	1,398	62,349
R.S.F.S.R.	Moscow	2,331	590	752	41,585
<i>Territories</i>					
1. Altai	Barnaul	58	6	6	930
2. Krasnodar	Krasnodar	69	11	7	584
3. Krasnoyarsk	Krasnoyarsk	43	8	10	867
4. Ordzhonikidze	Voroshilovsk	39	9	1	322
5. Far Eastern	Vladivostok	24	7	11	438
Ussuri Region	Voroshilov	16	4	3	311
6. Khabarovsk	Khabarovsk	43	11	12	685
Amur Region	Blagoveshchensk	16	3	6	345
Kamchatka Region	Petropavlovsk-Kamchatka	6	1	—	49
Lower Amur	Nikolayevsk-on-Amur	6	1	1	106
Sakhalin	Alexandrovsk-Sakhalinsk	5	2	2	31
<i>Regions</i>					
1. Archangel	Archangel	28	9	9	503
2. Vologda	Vologda	42	13	6	789
3. Voronezh	Voronezh	81	13	11	1,019
4. Gorki	Gorki	61	19	29	1,056
5. Ivanovo	Ivanovo	41	30	23	911
6. Irkutsk	Irkutsk	26	10	13	419
7. Kalinin	Kalinin	62	23	17	1,594
8. Kirov	Kirov	50	10	16	1,065
9. Kuibishev	Kuibishev	39	5	15	1,305
10. Kursk	Kursk	67	17	6	1,242

SOVIET REPUBLICS, TERRITORIES, REGIONS, AND AUTONOMOUS REPUBLICS	CAPITALS OF REPUBLICS AND ADMINISTRATIVE CENTRES OF TERRITORIES AND REGIONS	Dis- TRICTS	TOWNS	NUMBER OF WORKERS' SETTLEMENTS AND SETTLEMENTS OF TOWN TYPE	VILLAGE SOVIETS
<i>A.S.S.R.—(contd.)</i>					
13. Tartar	Kazan	63	12	8	1,697
14. Udmurt	Izhevsk	37	5	6	468
15. Chechen-Ingush	Grozny	23	2	3	224
16. Chuvash	Cheboksari	28	7	5	613
17. Yakut	Yakutsk	34	5	3	417
<i>Autonomous Regions</i>					
1. Adygei (Krasnodar Territory)	Maikop	6	1	—	58
2. Jewish (Khabarovsk Territory)	Birobidjan	4	2	6	52
3. Karachayev (Ordzhonikidze Territory)	Mikhoyan-Schakhar	6	1	1	54
4. Oirot (Altai Territory)	Oirot-Tura	10	1	—	117
5. Khakas (Krasnoyarsk Territory)	Abakan	7	2	7	112
6. Cherkess (Ordzhonikidze Territory)	Cherkessk	5	1	—	45
<i>National Districts</i>					
1. Aginski Buryat-Mongolian (Chita Region)	Aginskoye ¹	—	—	—	24
2. Komi-Perm (Perm Region)	Kudimkar	6	1	—	86
3. Koriak (Khabarovsk Territory, Kamchatka Region)	Palana ¹	4	—	—	54
4. Nenetz (Archangel Region)	Naryan-Mar	3	1	—	17
5. Ostyak-Vogul (Omsk Region)	Ostyak-Vogulsk ²	6	—	1	51
6. Taimir (Dolgan-Nenetz) (Krasnoyarsk Territory)	Dudinka ²	4	—	1	19
7. Ust-Ordinsk Buryat-Mongolian (Irkutsk Region)	Ust-Orda ¹	4	—	—	48
8. Chukhot (Khabarovsk Territory, Kamchatka Region)	Anadir ³	5	—	1	67
9. Evenki (Krasnoyarsk Territory)	Turinsk-Kultbas ³	3	—	1	17
10. Yamalo-Nenetz (Omsk Region)	Salekhar	3	—	—	—

SOVIET REPUBLICS, TERRITORIES, REGIONS, AND AUTONOMOUS REPUBLICS	CAPITALS OF REPUBLICS AND ADMINISTRATIVE CENTRES OF TERRITORIES AND REGIONS	Dis- TRICTS	TOWNS	NUMBER OF WORKERS, SETTLEMENTS AND SETTLEMENTS OF TOWN TYPE	VILLAGE SOVIETS
<i>Regions—(contd.)</i>					
2. Gornel	Gornel	15	6	2	240
3. Minsk	Minsk	21	6	3	285
4. Moghilev	Moghilev	21	12	2	363
5. Polesk	Moghir	17	3	1	215
<i>AZERBAIJAN S.S.R.</i>	Baku	66	25	20	1,113
<i>A.S.S.R.</i>					
Nakhichevan	Nakhichevan	6	2	1	57
<i>Autonomous Region</i>					
Nagorno-Karabakh	Stepankert	5	2	—	129
<i>GEORGIAN S.S.R.</i>	Tbilisi	68	27	23	1,097
<i>A.S.S.R.</i>					
1. Abkhazian	Sukhum	5	5	3	108
2. Adjarian	Batum	4	1	1	48
<i>Autonomous Region</i>					
South Ossetian	Stalinir	4	1	—	41
<i>ARMENIAN S.S.R.</i>	Erivan	37	9	10	675
<i>TURKEMENIAN S.S.R.</i>	Ashkabad	48	12	47	465
1. Kerkisk District	Kerki	7	1	9	46
2. Tashany District	Tashany	8	1	4	85
<i>UZBEK S.S.R.</i>	Tashkent	116	25	17	1,389
<i>Regions</i>					
1. Bukhara	Bukhara	28	6	6	325
Surkhan-Darinsk District	Termez	7	1	2	89
2. Samarkand	Samarkand	19	3	2	230
3. Tashkent	Tashkent	15	3	4	165
4. Ferghana	Ferghana	33	7	4	402
5. Khorezmian					

The U.S.S.R. as a World Power

THE Soviet Union occupies one-sixth of the land surface of the globe and, with the exception of the British Empire, which does not constitute a single continuous mass of land, is the largest state in the world.

It has access to the great seaways of the world through the ports on the White Sea, the Baltic, the Black Sea, and the Pacific Ocean. Its frontiers, extending across Europe into Asia, border upon the territories of Finland, Poland, Rumania, Turkey, Iran, Afghanistan, Chinese Turkestan, and Manchuria (Fig. 72), and the U.S.S.R. is connected with them by sea and railway routes. Both politically and economically, therefore, the Soviet Union has the possibility of exerting its influence at many points in Europe and Asia.

Although in relation to its great area this vast country is still rather thinly populated, the population is increasing rapidly year by year, and already the U.S.S.R. has grown from a state of some 134,000,000 people in 1920 to one of nearly 200,000,000 in 1940, and within this state many nationalities are living together in harmony, without political or economic discord.

Apart from its geographical position, however, the Soviet Union to-day occupies an important position as one of the foremost industrial powers of the world.

The output of metal, coal, and oil, industrial and agricultural products, has increased enormously since 1913, and it is known that within the territory of the U.S.S.R. there exists a large proportion of the world supplies of raw materials.

It must be remembered, however, that the output *per head of population*, of agricultural and industrial products had not reached that of the U.S.A. and Great Britain in 1939. Nevertheless, it was clear in 1939 that the rate of increase of productivity was such that if war had not intervened the

output per head of population in the U.S.S.R. might have exceeded that of the other great industrial nations within the next ten years. The total industrial output of 1938 was 655 per cent. of that of 1913. Labour productivity in all industry was in 1938 3.7 times as great as in 1913, while in 1937 agricultural output was double that of 1913.

An industrial country needs coal for transport and industry—especially coking coal for smelting. The coal resources of the U.S.S.R. are immense, and comparable only with those of the U.S.A. The Don and Kuznetsk basins alone together produced 98,000,000 tons in 1938, over three times the production of the Russian Empire in 1913. In addition to these major deposits smaller coalfields and brown coal, as well as peat, are being utilized on a large scale.

For agricultural expansion thousands of tractors and lorries are needed. Oil is required to provide fuel for them. The U.S.S.R. produced more than 30,000,000 tons—about 10 per cent. of the world output—in 1940, an amount exceeded only by the United States. There is much less oil in the world than coal, while its relatively small bulk and the fact that its use achieves greater economy of labour place its possessor in a very strong economic position.

A modern industrial state must utilize electrical power. In this respect also the U.S.S.R. occupies a leading position, being the second largest producer of electricity in Europe, and possessing some of the largest power stations and high-voltage transmission systems in the world, comparable only with those of the U.S.A. and Germany.

The mineral resources other than of coal and oil are also very great. Near the surface, or at no great distance below it, it is estimated that there are 10½ thousand million tons of iron ore, much of high quality. The output of pig-iron and steel (14,600,000 and 18,900,000 tons respectively in 1938) puts the U.S.S.R. in the third place in the world, after the U.S.A. and Germany, and with the expansion of the industrial regions of Siberia it is probable that eventually she will rise to first place.

Iron alone, however, is not sufficient for the requirements

of modern industry. In the manufacture of high-grade steels and alloys metals such as manganese, chrome, nickel, vanadium, etc., are necessary, while in the construction of machinery and electrical equipment, aeroplane, automobile, and tractor engines, aluminium and other non-ferrous metals are vital. The U.S.S.R. occupies first place in the world in manganese production, and is fortunate in possessing about 30 per cent. of the world's deposits of this metal, in addition to large and widely distributed deposits of other non-ferrous metals, and great reserves of bauxite in the neighbourhood of Tikhvin and the Urals (see p. 260).

These resources of metals provide materials for the machine-tool industry, the very basis of a state which wishes to take advantage of modern technique and so raise the standard of living of its peoples, provide for the defence of its frontiers and territory, and rise to a leading economic position in the modern world.

Another essential industry is concerned with the production of chemicals. In the U.S.S.R. apatite, a raw material for the making of phosphatic fertilizers, is found in the Khibin Mountains. The salts of the Kara Bogaz Gol are valuable for the manufacture of sulphates, soda, bromide, and sulphuric acid. Potassium salts are obtained from the Urals, and on the borders of the Saratov region and Kazakhstan. Sulphur deposits are worked in Central Asia (in the Ferghana valley, and South Turkmenia, for example) and near Kuibishev. Throughout the U.S.S.R. there are widespread phosphate-bearing deposits.

Mention must also be made of the gold-extracting and -mining industry and the manufacture of synthetic rubber. In the production of gold the U.S.S.R. is second only to South Africa, while its synthetic rubber factories, together with the plantations of kok-sagyz (see p. 214), satisfy a large proportion of the normal requirements of the country.

Great advances have also been made in agriculture, an essential factor in providing the increasing urban population with food, and industry with raw materials other than minerals. Grain-production now exceeds that of 1914, while the internal

consumption is incomparably higher and the exports have been reduced to a bare minimum.

The main producing areas—the Ukraine, Crimea, the Azov-Black Sea, and North Caucasian regions—occupy only 3 per cent. of the territory of the U.S.S.R., and contain 25 per cent. of the land sown to grain. The Lower Volga, Kursk, Voronezh, and Kuibishev regions contain about 20 per cent., and Western Siberia, Kazakhstan, and the Urals region a similar proportion. Although the northern districts of European Russia do not supply the rest of the country with any surplus of grain, they are to-day able to satisfy a large proportion of their own requirements—in striking contrast to the position which obtained before 1917, when they depended almost entirely upon the richer grain lands of the south and east. The limit of wheat cultivation has been moved farther north, where the deep snow offers protection from winter frosts, and the long hours of daylight in summer to some extent balance the short length of that season, besides increasing the yield per acre.

The area sown to technical crops has been increased. For example, more sugar-beet is produced than in any other country in the world. In 1913 less than two million acres of land were devoted to the cultivation of cotton. In 1938 there were more than five million acres of cotton plantations, and a number of them have achieved yields per acre which constitute world records. The U.S.S.R. is now the third largest producer of raw cotton.

When it is realized that the U.S.S.R. produces more peat, sugar-beet, flax, manganese, locomotives, railway-wagons, and agricultural machinery than any other state in the world, and more oil, machinery, agricultural machinery, motor-lorries, tractors, iron and copper ore, gold, and superphosphates than any country in Europe, as well as occupying a high place in the output of coal, electricity, iron, steel, chemicals, and cotton, it is obvious that the last twenty-five years have seen the transformation of a formerly backward agrarian country into one of the world's leading industrial nations (see also p. 601).

More significant than the phenomenal growth of industry, however, is its geographical redistribution. Whereas in Tsarist Russia a line from the Urals to the Caspian was practically the eastern frontier of industry, such as it was, the Soviet Union has added to the revived and reconstructed industrial centres of European Russia a powerful new industrial axis which extends eastward from the Urals, through Western Siberia and Irkutsk to Komsomolsk, Khabarovsk, and Vladivostok.

At the western end of this axis is a gigantic metallurgical-engineering-chemical-textile-food base—a huge triangle, its base the Ural-Kuznetsk Combine and its apex in the republics of Central Asia. Within this triangle are practically all the raw materials needed in a self-sufficient industrial region, and enough food (meat, milk, wheat, and fruit) to maintain a large population. Its geographical position enables it to send out its products by way of the Caspian Sea and the Volga, by rail westward to European Russia, southward to Iran, eastward to Central Siberia and the Far East, or by the Sinkiang Road from Asiatic Russia to China.

The Urals-Kuznetsk and other Western Siberian plants to-day produce more than 6,000,000 tons of pig-iron annually,¹ and manufacture high-quality steel for machine-tools, tractors, diesel, aeroplane, and automobile engines. The Kuznetsk coalfield alone produced 25,000,000 tons of excellent coking coal in 1940, and this output is supplemented by coal which is being mined to an increasing extent in the Urals, in addition to the production of the Karaganda mines. Urals bauxite is used in the making of aluminium. Timber from the north forms the basis of important chemical, acetone, cellulose, plastics, veneer, and plywood industries. The Urals and the Volga regions are developing their own supplies of oil and oil shales. The Karaganda and Altai regions supply non-ferrous metals. From Central Asia comes cotton and wool for the textile factories, kok-sagyz for the rubber industry,

¹ The production of metal in the Urals and eastern regions of the U.S.S.R. rose from 16 per cent. to 29.5 per cent. of the total between 1929 and 1937.

sugar-beet, leather, etc. Chemical factories, such as those at Aktyubinsk, supply the farms with fertilizers, and agriculture has expanded to such an extent that it could provide for a much larger population than that which occupies this part of the U.S.S.R. at present. The food industry includes such enterprises as the Sverdlovsk and Semipalatinsk meat combines, with enormous refrigerating plants and sausage factories. There are similar factories at Stalinabad and Ashkhabad. The Tagil works of the Urals provide refrigerator and cattle-vans which are so necessary for the distribution of meat and meat products over large areas. Thus the cattle of Kazakhstan and Central Asia provide the meat, the meat combines deal with carcasses and the manufacture of meat products, and the Tagil works provide the means of transport. Western Siberia provides wheat and sugar-beet, while the Bashkirian dairy farms alone can meet all the demands of the towns of the Urals for milk, butter, and cheese.¹ Western Siberia is another important centre for the production of these foodstuffs.

It was no accident that Kuibishev was chosen as an alternative administrative centre for the U.S.S.R. when Moscow was threatened by the German Army in 1941, for it occupies a central geographical position in relation to the new food and industrial base described above, just as Moscow occupies a central position in relation to the main industrial and agricultural regions of European Russia. Its hinterland possesses great reserves of food and industrial produce. It lies at a point where the Trans-Siberian Railway crosses the Volga, and is one of the chief centres for the distribution of grain and Caucasian oil to the north, east, and west. To the south are the newly developed irrigated lands of the Trans-Volga region, and on the river itself are some large hydro-electric stations. To the west and south-west are the Moscow, Gorki, Ivanovo, and Ukrainian industrial regions.

Just as Kuibishev is centrally placed between Europe and Asia on the one hand, and between the Caspian and the

¹ The dried-milk factory at Meleuzogorsky has a capacity of 1500 tons a year. At Uglich, on the Volga, is the largest cheese factory in the U.S.S.R.

Caucasus and the north of European Russia on the other, so Novosibirsk lies between the Ural-Kuznetsk-Central Asia triangle (to the west and south-west) and the new industrial regions of Central and Eastern Siberia. These new regions can receive supplies of raw materials and manufactured goods from the Ural-Kuznetsk Combine and from the mines and forests of the Far North, to supplement their own productive capacity.

The Irkutsk-Cheremkhovo region has its own local supplies of iron, salt, lime, bauxite, and other minerals, and coal-mines, which, together with those of the Tungus and Burei basins, yield over 6,000,000 tons a year.¹ Hence there is an abundance of raw material for the new chemical, iron and steel, aluminium, machine-tool, aero-engine, motor-engine, and synthetic rubber factories. The vast Siberian forests supply the Irkutsk plywood factories, which have a capacity of 16,000 cubic metres a year. The Irkutsk and Ulan Ude meat combines assure abundant supplies of fresh meat, and in addition to other meat products can manufacture up to 45 tons of sausages per day.

The projected Angara hydro-electric stations will supply this new industrial area with electric power. Reference to the map will make clear the favourable geographical situation of the region, lying at the cross-roads between Yakutia, the Far East, Mongolia, and the west. It is served by the Trans-Siberian Railway and the new alternative line around the northern end of Lake Baikal, while to the north of Irkutsk, connected with the town by a road, is the head of navigation of the Lena. It is proposed to make the Angara navigable, in order to provide a through waterway to the Yenesei, and along that river to the Tungus coal-mines, and the Arctic port of Igarka. To the west, at Krasnoyarsk, are important machine-tool works, and a large paper-cellulose plant.

Farther to the east lie the engineering, iron and steel, and machine-tool centres of Petrovsk, Chita, and Komsomolsk, the

¹ In 1940 the coal output of the Urals, Kuznetsk, and Eastern Siberian basins was equal to half that of the Donbas, thus forming a powerful fuel base for this new eastern 'industrial axis.'

railway-wagon and plywood factories of Birobijan, the machine-tool and engineering works, shipyards, and docks at the naval base of Vladivostock, Soviet Haven, and Petropavlovsk (Kamchatkha), and the oil-wells of Sakhalin. At Khabarovsk there is a modern meat combine, while there

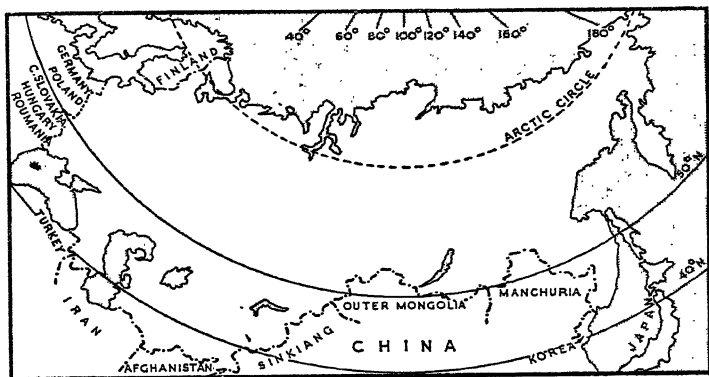


FIG. 72. THE STATES BORDERING THE SOVIET FRONTIERS

are new fish canneries at Komsomolsk, Khabarovsk, Soviet Haven, Petropavlovsk, and Vladivostock, producing at least 180,000,000 tins of fish products each year (see p. 342).

Hence, outside European Russia, the U.S.S.R. possesses two great centres of food and industry, and their position is particularly interesting in relation to the countries of the Middle East and Far East. These industrial centres, of infinite importance from a military and strategical point of view, since they provide a great reserve of food, raw materials, and manufactured goods during times of war, may be equally significant as the bases for trade and commerce in the future.

The U.S.S.R. possesses immense land and sea frontiers in Europe, across which it could trade with other countries. But the possibilities in Asia are probably far greater, since the Soviet Union, with its new industrial regions, is surrounded

here by nations which are only beginning their industrial development.

In the south railways and the Caspian Sea give access to Iran and the Persian Gulf. In Central Asia roads from the Turk-Sib Railway take the produce of the Urals, West Siberian, and Central Asiatic industries across mountains and deserts to Chungking, in China. To the north of this road lies Outer Mongolia—a Soviet sphere of influence since 1934—with its economy very much bound up with that of the U.S.S.R., from which it receives agricultural machinery, lorries, and other goods. Strategically, Outer Mongolia may be regarded as the northern flank which protects the road from Central Asia to China (see p. 420).

Thus, during war or peace, the expanding industries of the East can create strong economic ties between China and the U.S.S.R., and there is little doubt that in the future, Soviet nickel, copper, lead, manganese, chemicals, machinery, and machine-tools will be of great value in the development of China as an industrial power. This in turn will have tremendous repercussions upon the economic life of those lands bordering upon the Pacific.

The possible influence of the Soviet Union in future world economy is already being revealed during the present war. In the words of Maurice Edelman:¹

America helps Russia via the Caucasus, Russia helps China via the Sinkiang Road, China helps America by occupying Japan's arms. Russia helps Britain on the eastern front, Britain helps America in the Pacific, America helps China by sending tools to Russia. At the centre of these circles of help are the Urals industries and raw materials, the second arsenal and storehouse of democracy. . . . The Soviet Union, stretched across a sixth of the earth's surface, is a limb of the world's economy; its pains or its health affect the whole world.

¹ *How Russia Prepared* (Penguin Books, 1940).

APPENDIX

POPULATION OF THE U.S.S.R. BY REPUBLICS, 1926 and 1939¹

UNION REPUBLICS	1926 (DECEMBER)			1939 (JANUARY)			1939 AS PER- CENTAGE OF 1926		
	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
I. R.S.F.S.R.	16,785,189	76,672,807	93,457,996	36,658,008	72,620,606	109,278,614	218.4	94.7	116.9
II. Ukraine	5,373,553	23,669,381	29,042,934	11,195,620	19,764,601	30,960,221	208.3	83.5	106.6
III. Byelorussia.	847,890	4,135,410	4,983,240	1,372,522	4,195,454	5,567,976	161.9	101.5	111.7
IV. Azerbaijan	649,557	1,664,187	2,313,744	1,160,723	2,049,004	3,209,727	178.7	123.1	138.7
V. Georgia	594,221	2,083,012	2,677,233	1,066,560	2,475,729	3,542,289	179.5	118.9	132.3
VI. Armenia	167,098	714,192	881,290	366,416	915,183	1,281,599	219.3	128.1	145.4
VII. Turkmenia.	136,982	861,172	998,154	416,376	837,609	1,253,985	304.0	97.3	125.6
VIII. Uzbekistan.	1,012,274	3,553,158	4,565,432	1,445,064	4,837,382	6,282,446	142.8	136.1	137.6
IX. Tadzhikistan.	106,093	926,213	1,032,216	251,882	1,233,209	1,485,091	237.6	133.1	143.9
X. Kazakhstan	519,074	5,554,905	6,073,979	1,706,150	4,439,787	6,145,937	328.7	79.9	101.2
XI. Kirghizia	122,333	879,364	1,001,697	270,587	1,188,714	1,459,301	221.2	135.2	145.7
U.S.S.R.	26,314,114	120,713,801	147,027,915	55,909,908	114,557,278	170,467,186	212.5	94.9	115.9

¹ These and the following tables showing the population of the U.S.S.R. are taken from the tables published under the authority of the State Planning Commission of the U.S.S.R., and appear in *Nasha Strana*, No. 7, 1939 (Moscow).

POPULATION OF THE U.S.S.R. (JANUARY 17, 1939) BY REPUBLICS, TERRITORIES, PROVINCES, AND REGIONS

NOTE.—The populations of the Provinces, etc., of which the names are indented, have been included in the preceding entry.

REPUBLIC, TERRITORY, PROVINCE, REGION	POPULATION			REPUBLIC, TERRITORY, PROVINCE, REGION	POPULATION		
	Urban	Rural	Total		Urban	Rural	Total
R.S.F.S.R.	36,658,008	72,620,606	109,278,614	27. German Volga A.S.S.R.	131,647	473,895	605,542
1. Altai Territory	404,441	2,115,543	2,520,084	28. Novosibirsk Region	1,635,368	2,367,393	4,002,761
2. Archangel Region	23,573	137,858	161,431	29. Omsk Region	495,204	1,871,309	2,366,603
3. Bashkir A.S.S.R.	435,290	763,888	1,199,178	30. Ordinskizhe Territory	394,469	1,354,471	1,949,340
4. Buryat-Mongol A.S.S.R.	531,096	2,613,617	3,144,713	31. Orlov Province	10,623	139,392	149,925
5. Volga Region	163,425	378,745	542,170	32. Penza Region	28,646	63,888	92,534
6. Voronezh Region	284,987	1,377,277	1,662,264	33. Perm Region	823,280	1,425,376	2,248,656
7. Gorki Region	657,076	2,893,333	3,550,410	34. Primorye Territory	464,503	1,259,362	1,723,865
8. Dagestan A.S.S.R.	734,047	2,657,374	3,391,421	35. Rostov Region	1,563,097	422,711	2,005,808
9. Ivanovo Region	196,480	734,047	930,527	36. Ryazan Region	218,797	1,030,941	1,249,738
10. Irkutsk Region	1,168,395	1,481,988	2,650,383	37. Saratov Region	665,703	2,047,076	2,712,779
11. Kabardino-Balkarian A.S.S.R.	561,676	723,020	1,284,696	38. Sverdlovsk Region	1,508,507	1,003,668	2,512,175
12. Kalinin Region	84,662	274,574	359,236	39. North Osetian A.S.S.R.	154,851	174,094	328,945
13. Kaluzhsk A.S.S.R.	702,704	2,508,735	3,211,439	40. Smolensk Region	447,966	2,242,783	2,690,749
14. Karelian A.S.S.R.	185,700	220,743	406,443	41. Stalingrad Region	892,757	1,306,292	2,199,049
15. Kirov Region	130,440	318,705	449,145	42. Tambov Region	281,024	1,601,115	1,882,139
16. Komi A.S.S.R.	320,649	1,697,460	2,018,109	43. Tartar A.S.S.R.	621,839	2,297,564	2,919,403
17. Krasnodar Territory	29,163	266,806	318,969	44. Tula Region	711,440	1,336,710	2,048,150
Adygei Autonomous Province	764,844	2,408,041	3,172,885	45. Udmurt A.S.S.R.	320,720	899,287	1,220,007
18. Krasnoyarsk Territory	67,302	174,471	241,773	46. Khabarovsk Territory	647,653	783,222	1,430,875
Khakas Autonomous Province	551,419	1,368,583	1,920,002	47. Chelyabinsk Region	71,634	36,785	108,419
19. Crimean A.S.S.R.	109,416	161,239	270,655	48. Chechen-Ingush A.S.S.R.	1,181,871	1,621,078	2,802,949
20. Kulbishev Region	585,701	541,153	1,126,854	49. Chita Region	198,669	498,739	697,408
21. Kursk Region	773,453	1,994,409	2,767,862	50. Chukotka Region	510,900	648,578	1,159,478
22. Leningrad Region	266,245	2,910,599	3,176,844	51. Chuvasov A.S.S.R.	379,514	1,297,499	1,677,013
23. Mari A.S.S.R.	41,192,390	2,315,846	43,508,236	52. Yaroslavl Region	131,533	946,081	1,077,614
24. Mordovian A.S.S.R.	75,873	503,593	579,466	53. Yakutsk Territory	796,529	1,474,778	2,271,307
25. Moscow Region	82,486	1,106,112	1,188,598				

POPULATION OF THE TOWNS OF THE U.S.S.R. (1926 AND
1939) WITH MORE THAN 50,000 INHABITANTS ON
JANUARY 17, 1939

TOWN	POPULATION		1939 AS PER- CENTAGE OF 1926
	1926	1939	
1. Moscow	2,029,425	4,137,018	203.9
2. Leningrad	1,690,065	3,191,304	188.8
3. Kiev	513,637	846,293	164.8
4. Kharkov	417,342	833,432	199.7
5. Baku	453,333	809,347	178.5
6. Gorki	222,356	644,116	289.7
7. Odessa	420,862	604,223	143.6
8. Tashkent	323,613	585,005	180.8
9. Tbilisi	294,044	519,175	176.6
10. Rostov-on-Don	308,103	510,253	165.6
11. Dnepropetrovsk	236,717	500,662	211.5
12. Stalino	174,230	462,395	265.4
13. Stalingrad	151,490	445,476	294.1
14. Sverdlovsk	140,300	425,544	303.3
15. Novosibirsk	120,128	405,589	337.6
16. Kazan	179,023	401,665	224.4
17. Kuibishev	175,636	390,267	222.2
18. Saratov	219,547	375,860	171.2
19. Voronezh	121,612	326,896	268.7
20. Yaroslavl	114,277	298,065	260.8
21. Zaporozhe	55,744	289,188	518.8
22. Ivanovo	111,460	285,069	255.8
23. Archangel	76,774	281,091	366.1
24. Omsk	161,684	280,716	173.6
25. Chelyabinsk	59,307	273,127	460.5
26. Tula	155,005	272,403	175.7
27. Perm	119,776	255,196	213.1
28. Astrakhan	184,301	253,655	137.6
29. Ufa	98,537	245,863	249.5
30. Irkutsk	108,129	243,380	225.1
31. Makeyevka	79,421	240,145	302.4
32. Minsk	131,803	238,772	181.2
33. Alma Ata	45,395	230,528	507.8
34. Mariupol	63,920	222,427	348.0
35. Kalinin	108,413	216,131	199.4
36. Voroshilovgrad	71,765	213,007	296.8
37. Vladivostok	107,980	206,432	191.2
38. Krasnodar	161,843	203,946	126.0
39. Erivan	64,613	200,031	309.6
40. Khabarovsk	52,045	199,364	383.1
41. Krivoi Rog	38,228	197,621	517.0
42. Krasnoyarsk	72,261	189,999	262.9
43. Taganrog	86,444	188,808	218.4

POPULATION OF THE TOWNS OF THE U.S.S.R.—*continued*

TOWN	POPULATION		1939 AS PER- CENTAGE OF 1926
	1926	1939	
44. Izhevsk	63,211	175,740	278.0
45. Chkalov	123,283	172,925	140.3
46. Grozny	97,087	172,468	177.6
47. Stalinsk	3,894	169,538	4353.8
48. Vitebsk	98,857	167,424	169.4
49. Nikolayev	104,909	167,108	159.3
50. Karaganda	—	165,937	—
51. Nizhni Tagil	38,820	159,864	411.8
52. Penza	91,924	157,145	171.0
53. Smolensk	78,520	156,677	199.5
54. Shakhty	41,043	155,081	377.9
55. Barnaul	73,858	148,129	200.6
56. Dneprodzerzhinsk	34,150	147,829	432.9
57. Magnitogorsk	—	145,870	—
58. Gomel	86,409	144,169	166.8
59. Kirov	62,097	143,181	230.6
60. Simferopol	87,213	142,678	163.6
61. Tomsk	92,274	141,215	153.0
62. Ribinsk	55,546	139,011	250.3
63. Samarkand	105,206	134,346	127.7
64. Kemerovo	21,726	132,978	612.1
65. Poltava	91,984	130,305	141.7
66. Ulan-Ude	29,918	129,417	447.5
67. Ordzhonikidze (North Osetian A.S.S.R.)	78,346	127,172	162.3
68. Ashkhabad	51,593	126,580	245.3
69. Tambov	72,256	121,285	167.9
70. Kostroma	73,732	121,205	164.4
71. Kursk	82,440	119,972	145.5
72. Murmansk	8,777	117,054	1333.6
73. Sevastopol	74,551	111,946	150.2
74. Orel	75,968	110,567	145.5
75. Semipalatinsk	56,871	109,779	193.0
76. Gorlovka	23,125	108,693	470.0
77. Prokopyevsk	10,717	107,227	1000.5
78. Kerch	35,690	104,471	292.7
79. Dzerzhinsk	8,910	103,415	1160.7
80. Chita	61,526	102,555	156.7
81. Ulyanovsk	70,130	102,106	145.6
82. Kirovograd (Ukrainian S.S.R.)	66,467	100,331	150.9
83. Moghilev	50,222	99,440	198.0
84. Orekhovo-Zuyevo	62,841	99,329	158.1
85. Zlatoust	42,219	99,272	205.9

POPULATION OF THE TOWNS OF THE U.S.S.R.—continued

TOWN	POPULATION		1939 AS PER-CENTAGE OF 1926
	1926	1939	
86. Kirovobad	57,393	98,743	172·1
87. Kherson	58,801	97,186	165·3
88. Ryazan	50,919	95,358	187·3
89. Novorossisk	67,941	95,280	140·2
90. Vologda	57,976	95,194	164·2
91. Zhitomir	76,678	95,090	124·0
92. Konstantinovka	25,303	95,087	375·8
93. Kramatorsk	12,348	93,350	756·0
94. Vinnitsa	57,990	92,868	160·1
95. Frunze	36,610	92,659	253·1
96. Petropavlovsk	47,361	91,678	193·6
97. Serpukhov	55,891	90,766	162·4
98. Kremenchug	58,832	89,553	152·2
99. Kaluga	51,565	89,484	173·5
100. Ordzhonikidze (Ukraine)	24,329	88,246	362·7
101. Bryansk	45,962	87,473	190·3
102. Makhach-Kala	33,552	86,847	258·8
103. Voroshilovsk (Ordzhonikidze Territory)	58,640	85,100	145·1
104. Kokand	69,324	84,665	122·1
105. Bobruisk	51,296	84,107	164·0
106. Andizhan	73,465	83,691	113·9
107. Armavir	74,523	83,677	112·3
108. Stalinabad	5,607	82,540	1472·1
109. Ordzhonikidzergrad	36,040	82,331	228·4
110. Leninsk-Kuznetsky	19,645	81,980	417·3
111. Kutaisi	48,196	81,479	169·0
112. Novocherkassk	62,274	81,286	130·5
113. Noginsk	38,494	81,024	210·5
114. Biisk	45,561	80,190	176·0
115. Perovo	23,711	77,727	327·8
116. Syzran	50,293	77,679	154·5
117. Namangan	73,640	77,351	105·0
118. Stalinogorsk	—	76,207	—
119. Melitopol	25,289	75,735	299·5
120. Slavyansk	28,771	75,542	262·6
121. Tyumen	50,340	75,537	150·1
122. Kineshma	34,110	75,378	221·0
123. Kolomna	30,767	75,139	244·2
124. Chimkent	21,018	74,185	353·0
125. Engels	34,345	73,279	213·4
126. Podolsk	19,793	72,422	365·9
127. Anzhero Sudzhensk	30,199	71,079	235·4
128. Batumi	48,474	70,807	146·1
129. Komsomolsk	—	70,746	—

POPULATION OF THE TOWNS OF THE U.S.S.R.—*continued*

TOWN	POPULATION		1939 AS PER- CENTAGE OF 1926
	1926	1939	
130. Voroshilov	35,344	70,628	199.8
131. Losinoostrovsk	15,624	70,480	451.1
132. Michurinsk	49,853	70,202	140.8
133. Petrozavodsk	27,105	69,728	257.3
134. Sergo	17,224	68,360	396.9
135. Leninakan	42,313	67,707	160.0
136. Chernigov	35,234	67,356	191.2
137. Maikop	53,033	67,302	126.9
138. Kovrov	26,584	67,163	252.6
139. Vladimir	39,654	66,761	168.4
140. Lipetsk	21,439	66,625	310.8
141. Berdichev	55,613	66,306	119.2
142. Uralsk	36,352	66,201	182.1
143. Cheremkhovo	14,485	65,907	455.0
144. Orsk	13,581	65,799	484.5
145. Nadezhdinsk	33,345	64,719	194.1
146. Lyublino	8,391	64,332	766.7
147. Sumi	44,213	63,883	144.5
148. Vishne Volochok	32,022	63,642	198.7
149. Berezniki	16,138	63,575	393.9
150. Pyatigorsk	40,674	62,875	154.6
151. Dzhambul	24,761	62,723	253.3
152. Kuntsevo	9,978	60,963	611.0
153. Mitishchi	17,054	60,111	352.5
154. Pskov	43,226	59,898	138.6
155. Blagoveschensk	—	58,761	—
156. Chapayevsk	13,529	57,995	428.7
157. Shuya	34,475	57,950	168.1
158. Nikopol	14,214	57,841	406.9
159. Yegoryevsk	29,674	56,340	189.9
160. Artemovsk	37,780	55,165	146.0
161. Volsk	35,272	55,053	156.1
162. Voroshilovsk (Ukraine)	16,040	54,794	341.6
163. Chardzhou	13,950	54,739	392.4
164. Rzhhev	32,810	54,081	164.8
165. Kurgan	27,996	53,224	190.1
166. Borisoglebsk	39,788	52,055	130.8
167. Cherkassy	39,511	51,693	130.8
168. Berdyansk	26,408	51,664	195.6
169. Kislovodsk	25,913	51,289	197.9
170. Lysva	27,279	51,192	187.7
171. Kamensk Uralsky	5,367	50,897	948.3
172. Yelets	43,239	50,888	117.7
173. Krasniluch	12,425	50,829	409.1
174. Bukhara	46,778	50,382	107.7

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